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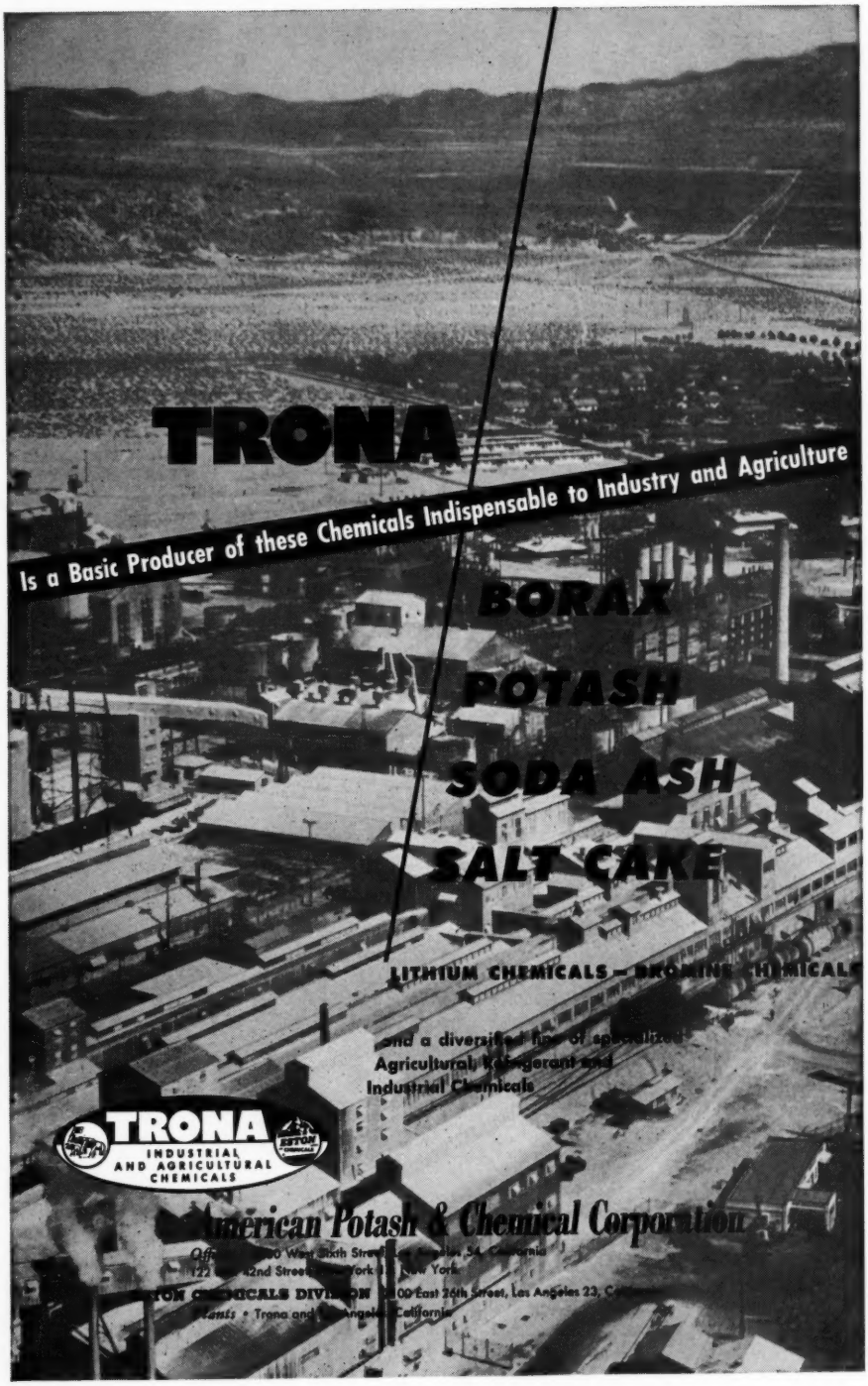
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Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

Editorial Office: 1102 16th Street, N. W., Washington 6, D. C.

VOLUME XXXVIII NO. 6

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The American Potash Institute, Inc.

1102 16th Street, N. W., Washington 6, D. C.

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A Harvest Queen

Better Crops with PLANT FOOD

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Vol. XXXVIII WASHINGTON, D. C., JUNE-JULY 1954 No. 6

It's up to you . . .

Mister Motorist, Watch Your Hearse Power

Jeff McDermid

BEING normally one of the standees a-standing by and one of the foot plodders going pedestrian, my view of the current speed craze on our city streets and country lanes is a dim and vanishing one. Possibly it's also more or less academic because I am one of the modern world's wonders—a guy who hasn't sat in the driver's cushion for five years. It's better exercise a-foot, especially at intersections where the 100-yard dash stimulates the leg muscles—if any, but is also a nuisance to a fellow who hates hospitals.

Gasoline is poisonous in at least three ways—in cleaning clothes, when taken internally, and when mixed with human negligence in the internal combustion engine. They all stink more or less, but the last item is the worst and getting "worser."

One gets so hopped-up on the nasty subject which seems to have no constructive cure that he is apt to turn into a verse scribbler—which is just as helpful perhaps as swearing and stomping around. Let's see what this form of relief gets us into. If you wish to avoid any collision with my meter, drive on but drive carefully!

Do you recall that laughable vaudevillian of the twenties, whose name was Roy Atwell? In his youthful stage days he was quite famous for a doggerel of

some merit called "Roy Atwell's Lament." Later Roy did a few turns on radio. He used to begin and end in a stutter phase, such as: "This is Doy Pottwell squeaking, no, no, I mean Loy Nutwell shrieking, no, streaking, slinking—oh, let it go, it's me."

For our present satisfaction, we paraphrase the opening of Roy's Lament, which went thus: "In this age of indigestion, it is oftentimes a question as to what to eat and what to leave alone; for each microbe and bacillus has a different way to kill us, but finally they claim us as their own."

My inspiring version relates to a worse killer and maimer than all of the bottulism, typhoid, and trichinosis we ingested before the days of the Food and Drug Administration. And here it goes:

"In this era of congestion, it is always quite a question as to when to stop and when to move ahead; and it's risky for us plodders when the speedsters and hot-rodders fill more graveyards than atomic bombs and lead."

TRANSPORTATION has probably always ranked next to a satisfying household life in the calendar of the American's goals and hopes. Not since my old grandpappy squatted down with a contented sigh amid the sands and running brooks of my native shire have we had many men of his kind and generation. He craved for no big travels and never envied the fellows who wanted to leave quick and arrive sudden. It took him three months to move from the seaboard to the midwest by easy stages and short shifts, and his own daddy required over 85 days to bob across the raging Atlantic. Men of that era stimulated no race records, except that of the human one, where they did quite well in numbers and quality.

Hence out of the early times we see just a few casual deaths and injuries chalked up to newfangled trains and coaches, frisky horses maybe, team collisions perhaps at times, and now and then a reckless runaway that dashed a buggy into splinters and broke some eggs and demijohns. True, there must have been serious injuries and numerous deaths due to highways and byways, sailboats and barges, high bicycles, and engine explosions and derailments. Nobody knows the figures in relation to the population back there, but being good at surmising when deprived of proof, I'll say there were no 40,000 deaths and two million injuries a year caused by badly managed private transportation facilities.

It's the American drive to beat former records which looks ghastly in the motor vehicle highway casualties. Such accidents caused 38,500 deaths in 1953; and in keeping with our beat-last-year philosophy, we killed 900 more then than the year before. "Make the best better" is the ordinarily sound slogan of youth in 4-H clubs. We trust it had no relation to the fact that last year about 25 per cent of the fatal accidents were those involving youthful drivers under 24. Those under 18 were the 1,520 drivers who had fatal accidents and the 53,400 who drove cars involved in non-fatal accidents. It's good to see so many rural youth organizations enrolling in new driver training programs and asking for closer supervision of beginning drivers.

OF course, that doesn't take in the bumptious and often careless hot-rod contingent—who have a magazine of their own, by the way, and include many really skillful and technically able kids who take pride in getting back from a rousing roar without serious consequences. Yet I am afraid that there is room for a lot of improvement in respect to closer parental control and supervision over farm youngsters who too often abuse road privileges with contempt for life and property. Farmers were a long time getting these nifty highways and improved town roads since the jolly days of the split-log drag and poll-tax road labor. They were brought in as "farm to market

roads" and not to be burned up by a generation of gas gadders.

Passenger cars are involved in far more bad road accidents than commercial vehicles—trucks mainly. One reason is the better driver training and direct responsibility for valuable cargoes. In spite of that explanation, every one of the auto deaths and serious injuries of 1953 that happened to private auto drivers can't be dismissed on the grounds of not having a precious cargo either. In still further cutting the accident ratio for commercial vehicles,

Iowa farmers have been campaigning to put reflectors on all tractors and other field machinery traveling the night roads.

Official accident figures always point to an excessive speed rate as the primary cause. With the latent power hidden in the modern motor, somebody somewhere is always trying to show off by passing somebody or just indulging in a temporary mania—too often because of indulging in hooch. The same lads who push their own physical mechanisms to the peak load and retain it there in a frenzy of ambition and worse are also the guys who misuse the energies of the engine.

Roaring along at top speed threw 13,870 persons out of about 30,000 who repose in their graves from the highway deaths of 1953. Fully 670,400 persons were injured by speedsters besides in the same grim catalog of disaster. If one includes the category labeled "reckless driving" we tabulate 4,550 more deaths and 167,600 injuries to the debit on the life books of 1953. Reckless driving can be made "wreckless" by pure chance and fool's luck—and that's why we see so many road hogs taking more than their share of pleasure's path and returning home to brag about the time they made and the keen control they maintain behind the wheel. Flaunting all regulations and safeguards, these demoniac drivers disregard right of way, dangerous curves or hills, and highway warnings. They cut in and weave around, spurt and jounce, crowd and jam, sway and swerve—and slam on the protesting brakes when their folly catches up with them.

They say you can't tell a murderer by looking at him face to face, or by talking with him casually. Fully half of the convicted assassins in our prisons or listed on the hangman's records disguise their inner natures or their aroused tempers by bland and even likeable countenances. In the same way to a great degree, we find noteworthy examples of highway murderers among humanity who wear ordinary commonplace American mugs—not appearing in the leastwise suspicious or dangerous. There's something that gets into a fellow's system that can intoxicate him without recourse to intoxicants and turns him into a motor malefactor and a public menace.

SMOOTH, straight, open roads are scenes of the most serious accidents. Cars going straight down the road had accidents in 1953 that killed 30,760 motorists and injured 1,456,000 —which amounts to 80 per cent of all hearse cases and 68 per cent of the injuries sustained which did not end in death. Just about the same percentages of all accidents occurred in 1952, 82 per cent and 69 per cent, when travel down a straight highway was involved.

Cars that were hit when turning in

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Fig. 1. On a rare day in June, the hired man was topdressing alfalfa with potash (right), but he forgot to come back (left), and so did the alfalfa.

Potash Pays on Forage in New England

By John L. Parsons and Mack Drake[1]

WITH growing appreciation of the important purposes to be fulfilled by grasslands, a more intensive use is being made of "improved pastures" for specific purposes. The old "permanent" pasture has graduated from the role of occupying the least fertile fields of the farm and is being considered on the same level as cultivated crops. An event accompanying this "graduation" is the disappearance of certain less desirable species such as Kentucky bluegrass, red top, bent grass, and wild white clover from the seed mixtures.

In general, these permanent pasture species were well adapted to the purpose they served. They are adapted to conditions of lowered fertility and continuous grazing and will persist under various extreme conditions of mismanagement. They are, however, less productive than the larger and more erect growing species, orchard grass, smooth brome grass, alfalfa, and ladino clover. Improved forage species can be expected to yield annually as much as three times the dry matter produced by a permanent pasture sod of bluegrass-white clover.

Many investigators have shown the desirability of maintaining a proper mixture of grass and legume. Not only

[1] Research Assistant Professor of Agronomy, Ohio Agricultural Experiment Station, formerly Instructor in Agronomy, and Research Professor of Chemistry, respectively, University of Massachusetts, Amherst, Massachusetts.

is a mixture of grass and legume higher yielding than single species but it provides a more palatable and nutritious forage and improves seasonal distribution of pasture. Because of the careful management and high fertility required by these improved species, farmers in New England have experienced great difficulty in maintaining stands. It is, therefore, of considerable economic importance to the farmer that management factors governing the grass-legume balance be studied.

It has been observed frequently that with time the quality of grass-legume mixtures degenerates because of the depletion of the desirable legumes and grasses and the dominance of the area by weedy grasses, such as bent grass, red top, Kentucky bluegrass, and quack grass. These are designated weedy grasses because they compete seriously with legumes, such as alfalfa and ladino clover, and desirable grasses, such as smooth brome, orchard grass, and timothy, for potassium and because under the climatic conditions of New England, these weedy grasses are semi-dormant during July and August. Thus, except in the spring, bent grass, red top, Kentucky bluegrass, and quack grass are low in production and palatability. This degeneration of desirable species is affected by several factors including light, moisture, and nutrient competition among species. In addition, management factors, such as frequency and height of clipping or grazing, are important.

It has been found that Kentucky bluegrass will make considerable root growth at temperatures as low as 40°F. and will make maximum growth at 60°F. Root growth declined, however, as the temperature rose above this level, practically ceasing when soil temperatures went above 80°F. This is characteristic of bluegrass even at high levels of fertility and soil moisture. Similar root growth measurements have been made on bent grass. High soil temperature accounts for the low yield and summer semi-dormancy period of Kentucky bluegrass and bent grass.

Establishment and particularly maintenance of improved pasture species involve problems of management which are much more exacting than those of permanent pastures. Fertility requirements of the improved pasture are high. The high yields obtained with such species as ladino clover, alfalfa, smooth brome, and orchard grass remove large quantities of plant nutrients. Liberal amounts of lime and fertilizer elements must be returned to most soils of New England in order to maintain maximum growth.

Several years of study in Connecticut showed that climatic factors were of less importance than fertility factors in maintaining grass-legume associations. In studying the ecological factors influencing pasture flora in the Northeast, it was found that plant succession on pasture soils was correlated with the level of soil fertility. It was found that bluegrass and wild white clover were the first species to come in as the fertility level of a cropped soil was depleted. As depletion of fertility continued, bent grasses came in as well and eventually sweet vernal, poverty grass, and other weeds and finally trees ingressed on the land. Once soil fertility has reached this state of depletion, all efforts to improve the crop by planting better species are to no avail unless the soil fertility factor is corrected.

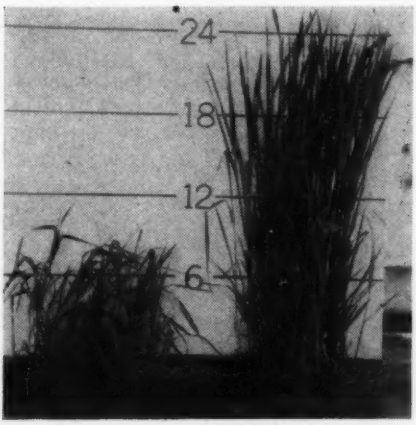

Fig. 2. Timothy—left, low potash; right, high potash.

With grass-legume associations there is a competition for potassium (K) among the species. Grasses are better competitors for this element than the legumes. Potassium competition becomes more serious as the level of available potassium drops during the growing season. On most soils low in potassium-supplying power, frequent liberal applications of potash fertilizer are required to maintain satisfactory levels of K in the plant throughout the growing season.

Many workers have found that grasses as well as legumes have a tendency to accumulate K in excess of plant needs when potash is applied in large amounts. Because of this luxury K uptake and species competition for K, it is believed that frequent light applications of potash fertilizers throughout the growing season are necessary to maintain stands and production of desirable legumes and grasses.

Results of Potash Research in Massachusetts

Field plots were established on a soil of loessial (wind blown) origin. Ladino clover, timothy, orchard, and smooth brome grass were seeded as pure stands in 1949. Herbage yields of ladino clover and grasses during three crop years showed marked response to potassium applications. Split applications of 150 pounds K_2O per acre annually (50 pounds after each of 3 cuttings) on orchard grass, brome grass, and ladino gave maximum yields of hay when phosphorus and other fertilizer elements were adequate (High K—Table I).

The increased hay production due to the split applications of potash was highly significant. Ladino clover plot yields were increased 28% (average of two harvest years) as a result of the added potash; however, ladino clover stands had failed on low potash plots before the end of the second harvest season. Timothy, brome grass, and orchard grass yields (three-year average) were increased 35%, 42%, and 78% respectively on high K treatments (Table I).

Forage Crops May Reduce Reserves of Soil Potassium

The efficiency with which the various crops removed the added potassium is shown in Table I. These data show

Fig. 3. Alfalfa without potash was overcome by weedy grasses. Note high potash plot in Fig. 4.

TABLE I.—TOTAL POUNDS OF K_2O ADDED AND POUNDS K_2O REMOVED PER ACRE IN THREE CROP YEARS. HAY YIELDS (15% MOISTURE) IN POUNDS PER ACRE PER YEAR.

Crop	Treatment	K_2O		% of K_2O Recovered	Dry Matter	
		Added	Removed		Average	3-year Total
Orchard	Low K	100	170	170	3,531	10,593
	High K	650	568	87	6,267	18,801
Brome	Low K	100	200	200	4,714	14,143
	High K	550	521	95	6,682	20,046
Timothy	Low K	100	184	184	5,324	15,971
	High K	450	354	79	7,169	21,506
Ladino—2-yr. Av.	Low K	100	112	112	2,765	5,531
	High K	500	212	42	3,541	7,083

the ability of grass to remove more K than ladino at low as well as at high K levels. Although assumedly liberal amounts of fertilizer potash were applied to the grasses studied, there was nearly complete removal of applied potassium. Amounts of K removed were equal to 79, 87, and 95% of that applied to timothy, orchard, and brome grass respectively (Table I). This points up the fact that it is not possible to increase the reserves of soil potassium when producing large yields of the forage grasses, smooth brome, orchard, or timothy on this and similar soils. When adequate potassium is not supplied, these forage crops will actually "mine" the soil of most of the available potassium as shown by the low K data (Table I).

Fig. 4. On the high potash plot the alfalfa remained vigorous and highly productive. Three cuttings were made annually, year after year.

Do Not Be Misled by Lack of Yield Response to Potassium in the First Year

There was little or no yield response to potassium the first crop year because of the initial level of available potassium in the soil (100 pounds K_2O available plus 100 pounds K_2O per acre applied at seeding time). This lack of response is frequently observed by Massachusetts farmers and often leads to the false belief that annual split applications of potash are not needed. Although the hay yield the first year was not affected, there was a marked effect in potassium content in the plant. On the low K treatments an amount equal to 85 to 95% of the initial 100 pounds of applied K_2O was removed by the grasses in the first cutting the first year. In the first harvest season, the K content of ladino was reduced from 2.3% (first cutting) to 1.5% (third cutting) on low K plots. The accompanying reduction for the grasses was from 2.3% to 1.2% for orchard grass, 1.4 to 0.8% for timothy, and 1.7 to 1.3% for brome grass. This percentage-wise reduction in potassium on the low K treatments was actually a forewarning of what was to occur to forage yields and vigor of the stand during the second and third crop years.

Fig. 5. Smooth brome grass—left, low potash; right, high potash.

Large Yield Response to K in Second and Third Harvest Years

During the second crop year the percentage increase in forage yield from potash applied at the rate of 50 pounds K_2O per acre after each of three cuttings for orchard grass, brome grass, and ladino was 113%, 54%, and 73% respectively, and for the third crop year, orchard grass and brome grass increased 180% and 102% respectively. Applying 50 pounds K_2O per acre after the first and second cuttings of timothy increased the yields 41% and 100% in the second and third years, respectively. Ladino on low potash plots was not harvested in the third year because of stand failure on low K plots.

Effect of Potash Fertilization on Longevity of Pure Stands of Grasses and Legumes

Ladino clover

Vegetative composition studies for three years show the importance of potash on maintaining ladino stands. The per cent of clover in low potash plots during the first crop year did not change. This may be attributed to stimulated growth resulting from the initial application of 100 pounds K_2O per acre plus the available potassium already in the soil. From October 1950 (end of first harvest year) to the spring of 1951, there was a large reduction (from 90 to 45%) in ladino clover stands on the low potash plots. The ladino clover was replaced by Kentucky bluegrass and bent grass. By the end of the 1951 season (second crop year) the ladino on the low potash plots was less than 15% of the total vegetation and by the spring of 1952 (third crop year) ladino comprised only 6% of the population. For the same periods on the high potash plots, the ladino decreased from over 90% in October (end of first crop year) to 81% in the following spring of 1951. From the spring of 1951 to the fall of 1951 (second crop year) the decrease was

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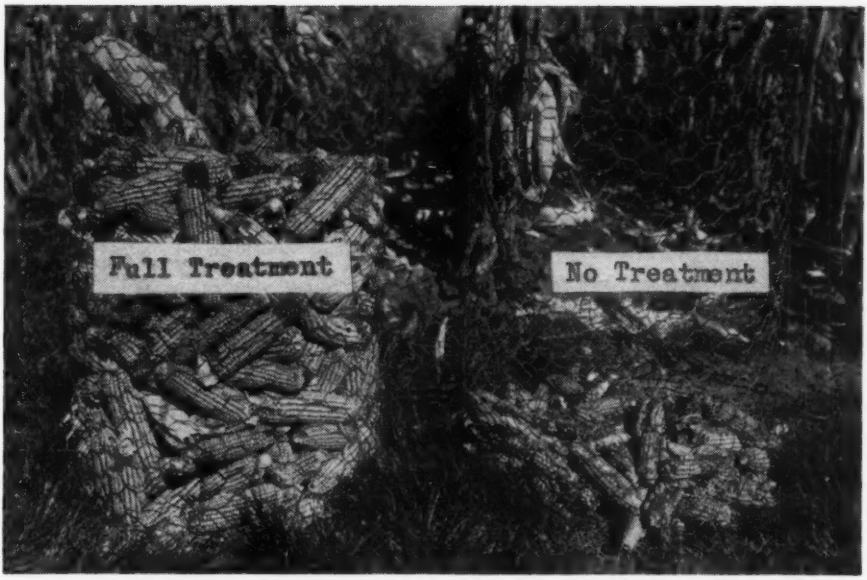

Fig. 1. More than 21,000 gallons of water were required to produce a bushel of the corn shown at the right. No soil treatments were used on this plot of claypan soil. The 1953 yield was 18 bushels per acre. The cropping system had been in operation for 12 years, with only the grain removed. Corn at the left, grown with full soil treatment on the same soil, required 5,600 gallons of water per bushel, or only about ¼ that of the corn on the untreated plot. The yield during the dry season of 1953 was 79 bu. per acre.

Fertility Increases Efficiency of Soil Moisture*

*By Dwight D. Smith***

IN addition to sharply increasing corn yield, full fertility treatments materially reduced the amount of water required to produce a bushel of corn in experiments at the Midwest Claypan Soil Conservation Experiment Farm near McCredie, Missouri, this past summer. Corn grown on adequately fertilized soil yielded 79 bushels per acre and used 16.1 inches of water from the surface 42 inches of soil. Without soil treatment, about 14 inches of water were required, but only 18 bushels were the crop.

Rainfall minus runoff during this period was 8.4 inches. The additional 7.7 inches of water required for the higher yield were secured from the reservoir of water stored in the soil from winter rains. But in terms of water use, only 5,600 gallons of water were required to produce a bushel of

* Cooperative Research U. S. Department of Agriculture, Agriculture Research Service, Soil and Water Conservation Research Branch and Missouri Agricultural Experiment Station.

** Soil Conservationist, Soil and Water Conservation Research Branch, A.R.S., U.S.D.A., and Research Associate, Department of Soils, Columbia, Missouri.

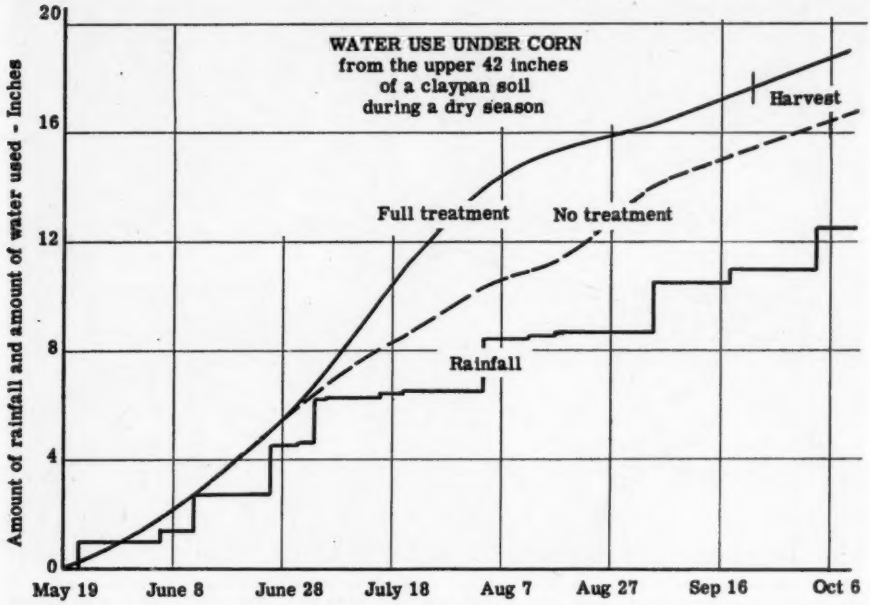

Fig. 2. Corn on soil with a full fertility treatment has the root development to take more water from the soil than when grown on untreated soil. Its more vigorous growth means earlier and more complete shading of the soil. This reduces water loss by evaporation, leaving more water for use by the plant.

corn with full soil treatments. Without soil treatments, over 21,000 gallons, or 4 times as much, were required per bushel. This greater efficiency in the use of a limited amount of water was of particular importance during this dry season.

The corn on these two areas was planted May 12. Measurements of the use of soil moisture from the upper 42 inches of soil cover the period beginning on May 19, after the corn had germinated, to September 2, when it was practically mature. The 42-inch layer of soil held a total of about 17½ inches of water when the first moisture samples were secured May 19. Only about 8 inches of this amount were available to the plants. This level of moisture was normal for late May. Three additional inches, however, would have been required for complete saturation, a condition which would have had detrimental effects on the young corn plants.

This soil has a relatively high water-holding capacity. It is a claypan soil named Mexico silt loam. It is deficient in phosphate, calcium, and to a limited extent, potash. The organic matter averages about 2.5% in the surface layer. The exchange capacity is relatively high, being about 18 milliequivalents per 100 gm. soil for the surface and 24 for the subsoil.

The removal of water from the unfertilized plot in corn was about ⅛ inch daily throughout practically all of the season. With full fertilizer treatment, the removal of water was at this rate only during the first third of the season. During the last 3 weeks of July it increased to over ¼ inch daily. A substantial part of the water used during the early period was lost through evaporation from the soil surface and not through plant use. As the corn grew, it required more water, but through shading of the soil and a lower supply near the surface, less water was lost by evaporation. Since plant roots on the plot with full treatment had penetrated to below the 42-inch depth by

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Agriculture in the Philippines

By Ivan E. Miles[1]

Mississippi State College, State College, Mississippi

"But others fell into good ground and brought forth fruit, some an hundredfold, some sixtyfold, some thirtyfold."

THE Philippine Islands, numbering more than 7,000, are located not far from the equator on the south, China on the west, Okinawa on the north, but there are about 8,000 miles of Pacific Ocean on the east. The temperature varies a great deal over the Islands, depending upon the altitude and location. Even in the low areas, however, the daytime temperature rarely exceeds 100° F. and the nights are often quite pleasant. There are two general seasons, the wet and the dry. It is always warm enough for crops to grow if ample water is present. There are a few areas in which rainfall is distributed so evenly that crops grow continuously. There are also a few areas where irrigation water is available throughout the year, thus permitting continuous cropping.

The people belong to the Brown race, but differ considerably from area to area. They are small of stature, but have a "big heart." Most of the educated people speak English, many speak Spanish, and all speak one or more of the 60-odd native dialects. The Spaniards occupied the country for over 300 years and quite naturally left a powerful imprint upon the people. Tagalog is one of the major dialects and has recently become the basic national language. From 30 to 40 per cent of the people can neither read nor write, but this situation is improving all the time.

A few of the people are wealthy, millions are poor, and there are not very many so-called middle class people. There is little or no violent starvation. Slow starvation due to eating the improper kind and amount of food is quite prevalent in many areas. About 80 per cent of the people belong to the Roman Catholic Church.

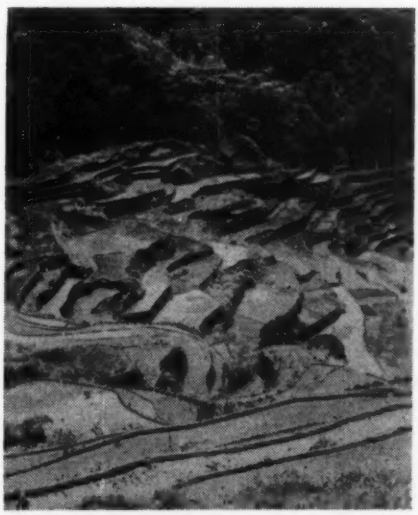


Fig. 1. The world-famous rice terraces are about 2,000 years old. Each terrace is from 6-12 feet high. The tillable land between each terrace usually varies in width from 4-15 feet. Best figures available indicate that each farmer has about 1,000 square meters of this land upon which to support his family.

[1] Leader in Extension Agronomy in Mississippi but recently served for 17 months as MSA Fertilizer Specialist in the Philippines.

Fig. 2. A crew of men, women, and children transplanting rice.

America occupied the country from 1898 to 1946 excluding the time of Japanese occupation during World War II. The people were very loyal to the Allied cause and thereby incurred the disfavor of the Japanese troops and brought much hardship upon themselves from the occupying forces.

The Guerrilla forces in the mountains were very active and were able to lend great assistance to the allies. After the war was over, most of the Guerrillas disbanded and went home, but some of the leadership, now called Hukbalahaps stirred up unrest among the very poor and hungry people and had them near the point of revolution. It was at this point that technical and economic assistance was requested of the United States for the purpose of undergirding the food production program.

The Agricultural Situation

About three fourths of the people in the Philippines earn their living from some phase of agriculture. There are about 20 million people on the Islands, and population is growing very fast. It has doubled during the last 33 years in spite of the tremendous toll taken by the war. Three fourths of the people live in barrios (small villages) most of which are under 2,500 in population.

Only about 20 per cent of the total land area is in cultivation. This area could probably be doubled without occupying particular hazardous land. There are considerable areas of good land in the faraway southern islands that have never been occupied by farming people. The average farmer has about 7.5 acres of tillable land, but the average size farm means little because of the many large farms. This is illustrated by the fact that about one half of the farms are less than 5 acres in size. As an over-all picture there are more than two people per cultivated acre of land. To make the situation even more serious, the yields of crops are among the lowest in the world.

Much of the land is rugged and mountainous and therefore not suited for cultivation. Some of this very steep government land is cleared, burned off, and farmed by the landless farmers by means of hand tools such as

knives and shovels. After two or three years the fertility of this soil is exhausted or it is washed away. Consequently, this land is deserted or is set to legume trees for 10 or 12 years to recuperate for another 2- or 3-year tour of duty. These shifting farmers are a great problem, not only in the Philippines but for large areas of Asia.

Much of the cultivated soil is of volcanic origin and is therefore potentially pretty good soil. However, to offset this advantage, there are a number of rather serious factors mitigating the production of sufficient food. Some of these factors are:

1. Much of the foundation stock of both seed and livestock was lost during the war.
2. The size of the farm is too small for a family to make a living.
3. There is insufficient power (water buffalos) to break the seedbed deep and thorough.
4. Soil erosion is quite serious in some areas.
5. Little or no fertilizer had been used on food crops until recently even though the land had been in cultivation for hundreds of years. (Sugar cane had been fertilized for years. It is the principal export crop.)
6. Insects, rats, and disease are serious in some areas, destroying large amounts of food.
7. Credit with which to purchase fertilizer, rat poison, and insecticides is difficult to secure without paying usurious rates of interest. Interest of 100 per cent annually is said to be common with many paying much more.
8. There is not enough irrigation water made available for the highest production of rice in many areas, even during the rainy season, and only enough for a small part of the rice land to be farmed during the dry season.
9. Storage facilities are very short, consequently the crop often has to be sold immediately after harvest at a great disadvantage to the farmer.
10. The market facilities, supervision, and control are very poor for handling rice and corn.
11. Few modern and practical tools are available for producing and harvesting the crops on small farms.
12. It is difficult for the farmer to secure the needed information in such a manner and form that he can understand and use it.

As a result of all these disturbing and discouraging influences, crop yields have been very low and consequently great quantities of rice have been imported for a number of years.

Rice is the principal food crop, occupying some 43 per cent of the cultivated land. Corn is grown to some extent in practically every province but occupies a large acreage and has an important place in the diet in five provinces. Yields are very low.

Corrective Measures Initiated

The Philippine Government had initiated an active food production program before the economic and technical assistance was requested. But a great deal more food and other assistance were needed.

The assistance program in addition to agriculture included health, highway, industrial development, educa-

Fig. 3. The author (second from the left) interviewing folks who have carried this fertilizer on their backs 5.5 miles. They could not get it hauled to their farms.

tion, small industry, and government administration.

In the field of agriculture the assistance program included several projects:

1. Fertilization of food crops
2. Production of pure seed
3. Irrigation of rice
4. Importing and increasing foundation livestock and poultry
5. Resettlement of new agricultural lands
6. Forestry management and processing
7. Research on soil fertility, soil erosion, and plant diseases
8. Soil conservation demonstrations
9. Pest control—insects, rats, and plant diseases
10. Gathering and disseminating agricultural information
11. Establishing a Bureau of Agricultural Extension Service
12. Assistance in rebuilding and equipping the National Agricultural College
13. Establishing rural banks and cooperatives.

All of these projects were designed to complement each other and contribute to the immediate food production program and to a sound long-time agricultural program.

In view of the fact that many of the soils had been farmed continuously for many years, and since little or no fertilizer had been used until recently, the yields were very low. Both the Philippine Government and the Mission felt that a good fertilization program was one of the quickest and most effective ways of aiding the small farmers and increasing food production. The Philippine Department of Agriculture had already initiated a fertilization program. It was decided to implement and greatly enlarge this program, and that was what was done. For the first year or two it was among the largest projects of the Mission.

The objectives of the project were: To increase the production of rice, corn, vegetables, and fruits by small farmers; to demonstrate on as broad a scale as possible the need, use, and value of fertilizer in increasing food crops; and to make information on crop responses to fertilization available.

In order that the farmers might become familiar with fertilizer and what it could do for them, a great deal of educational work had to be done. The educational work was initiated along several lines:

1. Lectures on the need, use, and value of fertilizers were given to farmers, farm leaders, teachers, students, religious leaders, politicians, civic leaders, and others over the nation.
2. Personal contacts were made with literally thousands of people.
3. Field visits with the agricultural leaders were made frequently.
4. Soils and plants were studied and tested for plant-food deficiencies.
5. A rice production contest was initiated in one province.
6. About 1,100 lime and fertilizer demonstrations were planned and initiated at strategic points over the nation. These fertilizer demonstration trials on rice included the following treatments:

(a) Nitrogen alone
(b) Nitrogen and phosphorus
(c) Nitrogen, phosphorus, and potash
(d) Nitrogen, phosphorus, potash, and lime
(e) Control
(f) Nitrogen, phosphorus, potash, at half rate
(g) Nitrogen, phosphorus, and potash at double rate
(h) Nitrogen, phosphorus, and potash at triple rate.

The corn fertilizer trials were approached along similar lines except additional nitrogen was applied to the corn as a sidedressing.

7. Field days were held on several of the more important crops including rice, corn, onions, and citrus.
8. A model rice farm demonstration area, including all farms in an

Fig. 4. Results of a corn demonstration: left, 300 lbs. 12-12-12 plus 300 lbs. ammonium sulphate plus one ton of lime; right, no fertilizer or lime.

irrigation project, was started. The subject matter specialists obligated themselves to furnish whatever assistance was needed to the farmers of this model rice farm demonstration area to show what could be done if the best information available were used.

Early in the life of the fertilizer project it was realized that additional research work was needed on the kind and amount of the fertilizer needed for the various crops and soils. Consequently some comprehensive fertility experiments were planned and some 40-odd of these experiments were conducted by the Bureau of Soil Conservation during the years 1952 and 1953.

Some Results

Rice, and in some instances corn, had been on the same land year after year for a very long time with little or no fertilizer used until recently. Consequently the average yields were very low. Therefore the proper use of fertilizers when accompanied with good management otherwise gave excellent results. Some of the results from the fertilizer demonstrations were extremely interesting to the local agricultural leadership.

There seemed to be a prevailing idea even among the agricultural leaders that phosphorus was the element most needed for corn production and that too much nitrogen was apt to make the corn become sterile. Furthermore, if any fertilizer was to be used on corn, it should be applied after the corn was up 8-10 inches high. In spite of these beliefs about corn fertilization, most of them were willing to try a new approach and did so with gusto, following the progress of the corn all the way through to the harvest.

In the fertilizer demonstrations which were put out on corn, the complete fertilizer was normally put down before the corn was planted and a fairly liberal application of nitrogen was applied later as a sidedressing when the corn was about knee-high. The best yields from these corn demonstrations were generally secured where 300 lbs. of 12-12-12 and a sidedressing of 300 lbs. of ammonium sulphate per acre were used.

There had been a rather serious shortage in the production of rice, the basic food crop, for a long time. It was quite natural that any serious effort to increase production of this crop

Fig. 5. Results of a rice demonstration: left, stack represents the yield of rough rice without fertilizer—1,250 lbs. per acre; center, stack represents the production where 267 lbs. of 12-12-12 were applied—3,025 lbs. per acre; right, stack represents the production where 267 lbs. of 12-0-0 were used—1,885 lbs. per acre.

would be followed with great interest. One thing that created a great deal of interest among agricultural and political leaders as well as farmers and which undoubtedly increased over-all production very materially was the rice production contest in one of the leading rice producing provinces. The winner of this contest was a lady. She increased her production 500 per cent by fertilization and good management.

In one irrigation project area, rice production was doubled when water was applied and tripled when irrigated and fertilized.

The information obtained from the demonstrations on rice indicated that the use of 265 lbs. of 12-12-12 fertilizer mixture per acre was the best treatment for upland rice. In the case of lowland rice, about 225 lbs. of 12-12-12 seemed to give the best results. A great deal of research covering the wide variations in soil and climatic conditions is needed to ascertain the fertilizer requirements of the different crops under various conditions. Some research work has been done in this field but a great deal more is needed and the fertility research work has been very greatly expanded during the last two years.

Even though additional information is needed badly, the general use of fertilizer when accompanied by good farm management practices has given such good results that most of the farmers of the nation are fertilizer conscious. Some farmers will go to great extremes to secure fertilizer.

Summary

By way of summary it should be made clear that the people of the Philippines are a fine people and that they are anxious to provide for their own needs. Circumstances beyond their control have greatly aggravated their food shortage and consequently they have found themselves in rather serious circumstances. Assistance was requested from the United States and was granted. The assistance was given in the form of specialists in the various fields of government and industry and also as direct economic assistance. This assistance is being well received, generally, and very much appreciated.

Surveying California Citrus With Leaf Analysis

M. E. McCollam and F. S. Fullmer, San Jose, California

PROBLEMS in citrus tree nutrition in California have been studied with the aid of leaf analysis for the past 10 years or more. Interpretations based upon leaf data have been of great practical value to fruit growers. The method is now being used by commercial agricultural service laboratories as well as by the research departments of the experiment station.

When used in identifying or confirming tree symptoms, affected trees are leaf sampled. Analytical data from these samples either confirm or reject the premise that the symptoms indicate a nutritional deficiency or excess. The leaf data, therefore, are a basis for determining the need for and the nature of further work in the field to confirm the tree symptoms and the practice necessary for tree recovery.

When a leaf survey is made, an orchard region is leaf sampled extensively for nutritional status. Suspected problem areas within this extensively sampled area are then leaf sampled more intensively. The leaf analysis data then form the basis for the intelligent location of fertilizer trials and determine as well the nutrient element

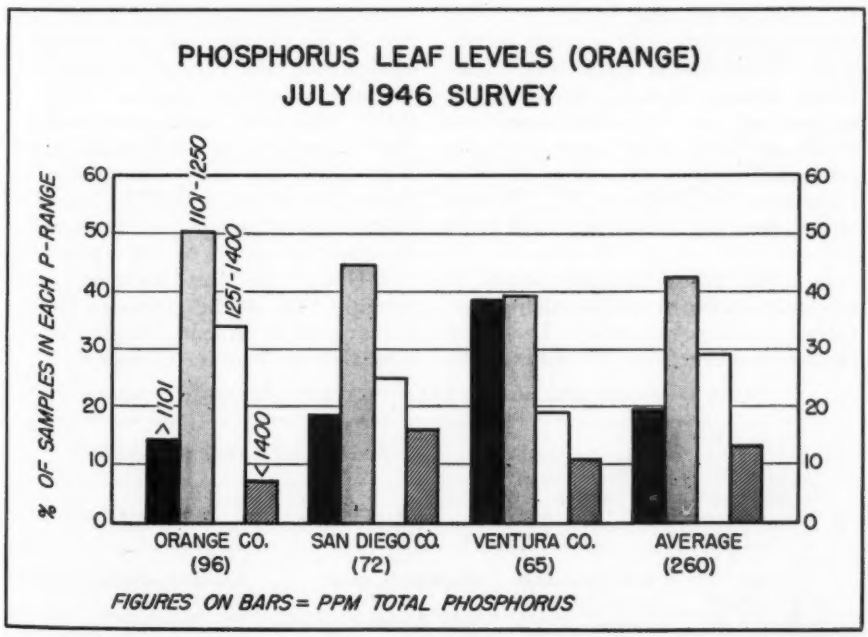


Figure 1

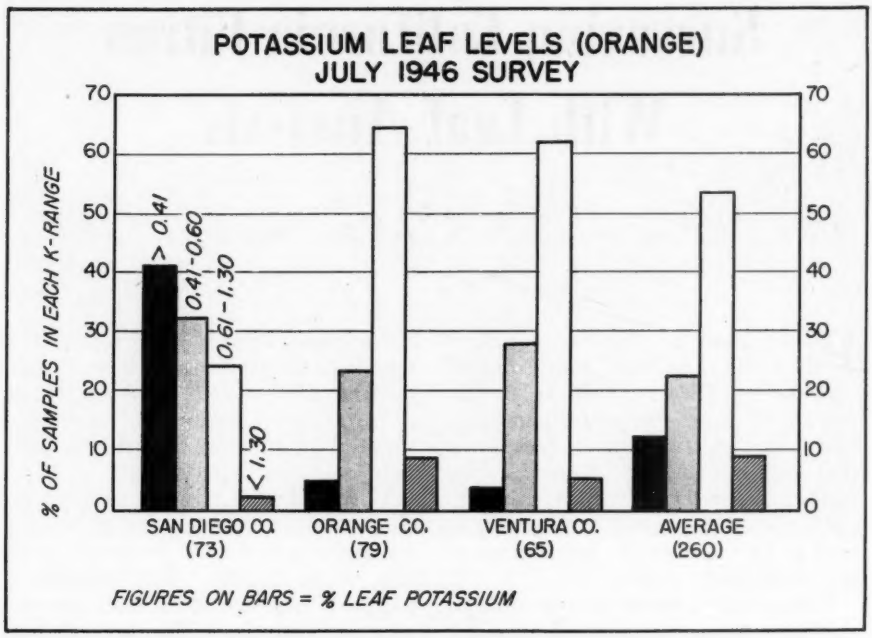


Figure 2

most likely to cause tree response.

The survey method has been used to learn the range in levels of nutrients in citrus leaves and locate areas for field experiments. As a result of this work, relationships have been established between certain nutrient levels in the leaf and deficiency symptoms, yields, and fruit sizes. Among articles published on this subject are those by Chapman and Fullmer (1), Aldrich and Coony (2), and Parker and Jones (3).

In 1946, a leaf analysis survey of orange groves in several southern California counties was made. Leaf samples were taken from 260 different locations in the area. In Fig. 1 the percentage of samples falling into various ranges of leaf phosphorus is shown for three separate counties and for an average of all samples taken. Embleton, Kirkpatrick, and Parker (4) mention a tentative deficiency range of 0.07% to 0.10% phosphorus when determined on three- to seven-month-old orange leaves. The likelihood of a phosphorus response, therefore, would be most existent in those orange groves where leaf phosphorus was >1101 ppm. or >0.11%. In this category were roughly 12% of the groves in Orange County, 15% in San Diego County, and 37% in Ventura County.

TABLE I.—INTERPRETATION OF LEAF POTASSIUM LEVELS *(Oranges)*

% K (D. M. Basis)	Potassium status	Result of raising leaf potassium	
		On yields	On fruit size
0.40	Deficient range	Medium to good	Good to excellent increase
0.40 to 0.60	Doubtful	?	Good increase
0.60 to 1.30	Possibly ample	Very doubtful increase	Fair increase
1.30	Ample	No increase	Very slight increase

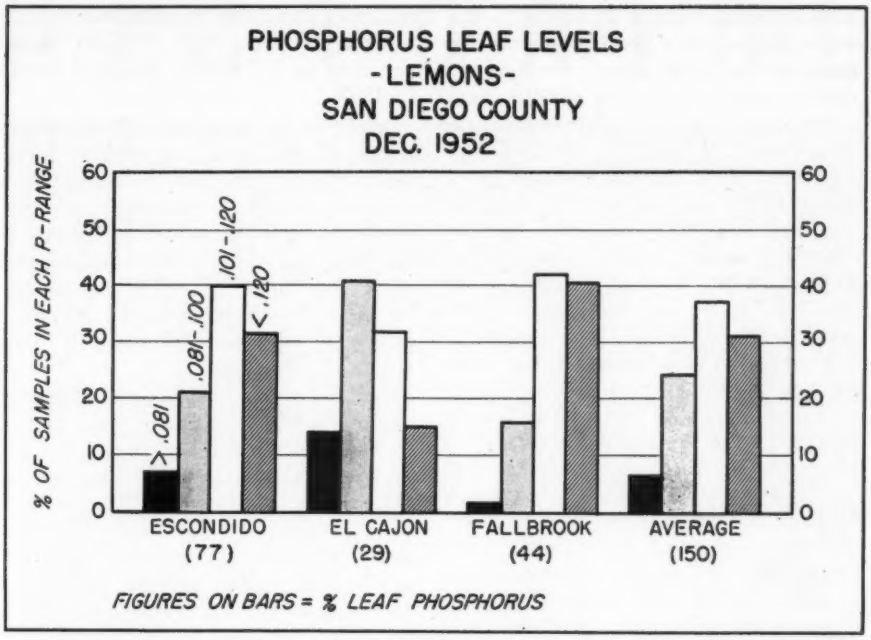


Figure 3

In Fig. 2 the percentage of samples falling into various ranges of leaf potassium is shown for the same three counties and for an average of all samples. In Table I a basis for interpreting potassium leaf levels is shown, using data previously published by Chapman (1). It can be seen from the survey that approximately 40% of the leaf samples from San Diego County were in range (>0.41% K) where a response in yield might be expected and

TABLE II.—LEMON FERTILIZER TRIALS VENTURA COUNTY*

Treatment	Yield F. Boxes/A.		% Leaf P 12/52	% Leaf K 12/52
	1951	1952		
	Mulched with cotton hulls			
N	806	455	.090	.62
NK	962	598	.103	.89
NP	1053	832	.126	.63
NPK	1118	884	.111	.94
	Non-mulched			
N	767	559	.097	.59
NK	832	546	.103	.67
NP	897	702	.122	.47
NPK	975	832	.120	.67

*Acknowledgment is made to E. J. Curran, Fruit Growers Laboratory, Santa Paula, California and to E. D. Hardison, Hardison Ranch Company for the data in this tabulation.

30% were in a range (0.41-0.60% K) where there was a good possibility for increases in fruit size. In Orange County about 5% of the samples were in the range (>0.41% K) where a response in yield might be expected, and 22% were in the range (0.41-0.60% K) where there was a good possibility of fruit size increase. In Ventura County about 4% of the samples indicated that a yield response might be obtained, while 27% of the samples indicated good possibility of fruit size increase.

During the past five years, leaf analysis established the fact that a number of lemon groves in San Diego County and a few in Ventura County had a very low level of phosphorus in the trees. Some also showed a fairly low level of leaf potassium. Field plots for the study of fertilizer response were established in some of these lemon groves, and it was determined that phosphorus applications produced yield increases and caused the disappearance of certain abnormal leaf symptoms. It was further determined that potassium applications caused an additional increase in lemon yields when phosphorus was supplied. Table II shows some of these data from a Ventura County grove. In this test the addition of phosphorus fertilizer caused a large increase in yield of lemons both in 1951 and 1952. When potassium fertilizer was added to the phosphorus, an additional increase in yield was obtained, amounting to 65 field boxes per acre in 1951 and 52 field boxes in 1952 on the mulched plots. On the non-mulched plots, the increase due to potassium fertilizer was 78 field boxes per acre in 1951 and 130 field boxes in 1952.

In Table III the results of a field test in San Diego County are shown. Here again the phosphorus was the nutrient primarily needed, and large increases in yield were obtained. The same effect from an addition of potassium fertilizer was again also obtained, namely an added yield increase of 140 field boxes per acre in 1951 and 100 field boxes in 1952.

In 1952 a more extensive leaf analysis survey on lemons in San Diego County was undertaken, and leaf samples were taken from 150 locations in three areas of the county—Escondido, El Cajon, and Fallbrook. The leaf analyses charted in Fig. 3 show that about 7% of the samples fell in the range of 0.08% P or below, in which response to phosphorus fertilizer is quite certain. An additional 26% of the samples fell in the range 0.081 to 0.100% P in which a probable need for phosphorus fertilizer is indicated. It should be mentioned in connection with the Fallbrook area that phosphorus need had been recognized and phosphorus fertilizer had been applied to many groves in this locality for a few years prior to the leaf analysis survey. This undoubtedly accounts for the very low percentage of leaf analyses falling into the range below 0.08% in the Fallbrook area.

(*Turn to page* 40)

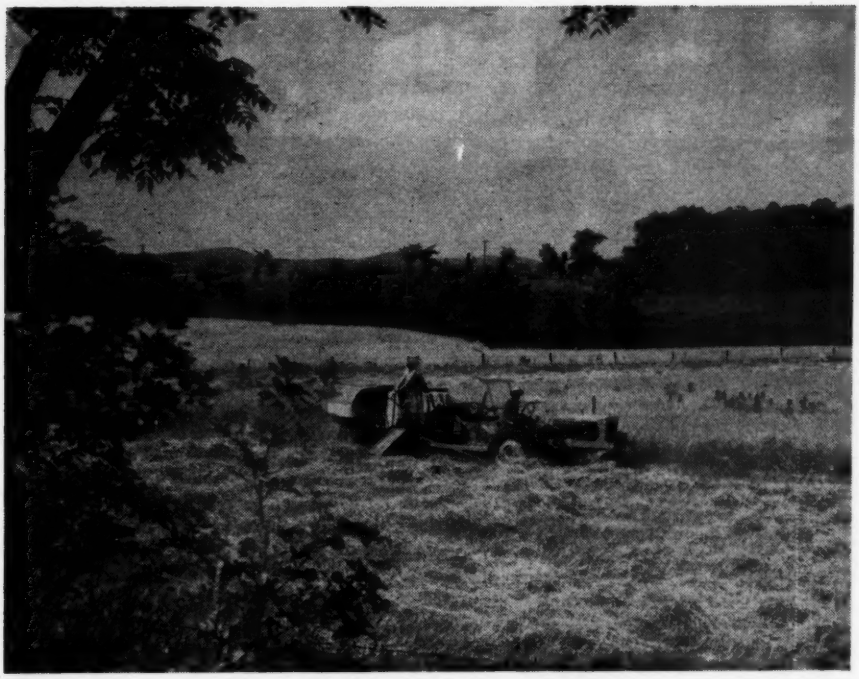
TABLE III.—LEMON FERTILIZER TRIAL—SAN DIEGO COUNTY*

Treatment	Yield F. Boxes/A.		% Leaf P 12/52	% Leaf K 12/52
	1951	1952		
N	740	180	.062	1.02
NP	970	950	.133	.59
NPK	1110	1050	.109	.63

*Acknowledgment is made to J. J. Coony, formerly Farm Advisor in San Diego County and now County Director of Extension in Orange County for the data in this tabulation.

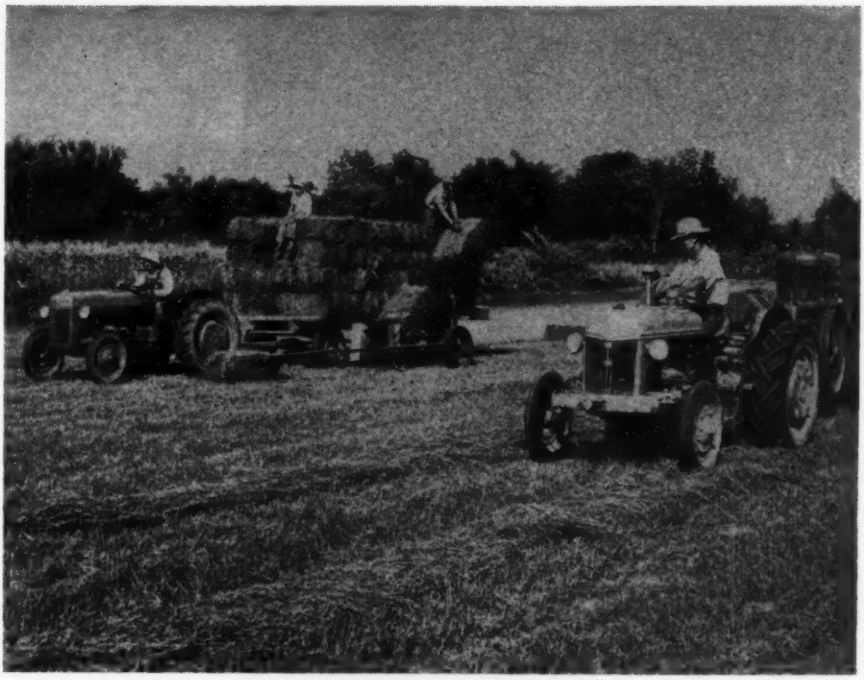
PICTORIAL

More fun than Easter!



Above: Combining makes harvesting easier.

Below: Shocking grain took time and labor.



Above: Modern equipment speeds hay making.

Below: Older methods fascinated youngsters.

Left: Use of ordinary kitchen stove coal scuttle makes one of the handiest methods of filling fertilizer boxes in sidedressing crops, particularly if they require high lifting.

Below: Grain bundles being threshed on the grounds at the Midwest Old Settlers & Threshers Reunion, Mt. Pleasant, Iowa—the first time many there had ever seen a threshing machine in operation, and especially when pulled by a steam engine.

The Editors Talk

Our Cover Picture

"Grass is the forgiveness of nature—her constant benediction." These words uttered by the Honorable J. G. Ingalls of Kansas in 1872 truly bespeak the importance and dependence that society has long placed on this important crop of many uses. But grass in the concept of present-day grassland agriculture embraces also the common association of legumes. We have learned from long experience and extensive research with forage crops that grass-legume associations result in larger yields, improved palatability, and greater promise of economic returns.

Historically our permanent pastures, especially in the Northeast, have come through several stages of impoverishment, each followed by a lower production of forage of inferior quality. Depletion of the supply of lime and available phosphorus is usually the first stage encountered and is reflected in a less vigorous growth of the grasses and legumes. This is followed soon thereafter by the exhaustion of available potash, disappearance of legumes, and the appearance of inferior species of grasses, weeds, moss, and finally brush. Most of our permanent pastures in the Northeast passed the first stage of fertility exhaustion more than a century ago. While lime and phosphorus are universally recognized as the basis of any successful pasture treatment, recent research data show that potash is of equal importance, particularly where emphasis is placed on the need for legumes in pastures.

With the grass-legume associations, competition among the species for potassium is keen. One of the important reasons for disappearances of legumes in legume-grass associations is that legumes cannot compete successfully with grasses for available potassium. The explanation advanced by Massachusetts scientists is that in the case of plants with a relatively greater exchange capacity of the plant root colloid, at low ionic concentrations the divalent ions calcium and magnesium are adsorbed in relatively greater amounts than the monovalent potassium ions from the soil colloid. At low levels of potassium, grasses which have low exchange capacity roots take up potassium at the expense of calcium and magnesium. Legumes, on the other hand, having high exchange capacity roots take up calcium and magnesium at the expense of potassium.

Elsewhere in this issue Drs. Parsons and Drake of the University of Massachusetts' scientific staff discuss in realistic terms the increasingly important role of potash under the title—"Potash Pays on Forage in New England." The effect of potash on yield, longevity of pure stands of many high-yielding grasses and legumes, as well as grass-legume associations, point convincingly to the desirability of employing split applications of potash for maximum beneficial effects and efficiency of this important plant food.

The cover picture is a contrast between fertilizer practices involving normal potash applications vs recommended with respect to potash. The plants on the left from a low potash plot in a 3-year experiment received only 100 lbs. of K_2O per acre at seeding time in addition to the basic application of lime and phos-

phorus. The plants at the right were from a plot which received the basic application at seeding time and 100 lbs. K_2O after each of three cuttings in 1950 and 50 lbs. after each of three cuttings in 1951 and 1952. In summarizing, in the three years the high potash maintenance treatment for orchard grass totaled 600 lbs. K_2O in contrast to the low potash treatment of only 100 lbs. K_2O.

The details of this experiment are more fully covered in the article mentioned.

Safety Week

"I request all persons and organizations interested in farm life and welfare to join in the campaign to free as many farm homes as possible from the tragedies and losses caused by needless accidents." Thus spoke President Dwight D. Eisenhower in proclaiming July 25-31 the 11th National Farm Safety Week.

It would be most interesting to know how much these eleven years of effort to create a safety consciousness have lessened accidents to farmers and their families. Such intangibles cannot be measured, of course. But considering the still terrific loss of life and the time and expense sacrificed to injuries, credit due the campaign must be overwhelming.

The number of fatal accidents to farmworkers is greater than in any other occupation in the United States. Serious injuries are nearly 85 times as many as the fatalities. In numbers, there were 3,800 deaths checked against agriculture in 1953, and 320,000 injuries. Seven hundred of the fatal farm accidents involved wheel tractors, and one third of the fatal tractor accidents reported involved persons under 20 years of age. One case in ten was a child under five.

How many of these could have been avoided if greater efforts toward promoting safety consciousness had been made? What could you and I have done to have helped? The following farm safety week quiz offers some suggestions:

Sun.: How can I teach safety? (Setting a good example may be the starting place.)

Mon.: What do I owe my family in the matter of safety?

Tues.: What do I owe the community in the matter of safety?

Wed.: What do I owe myself in the matter of safety?

Thur.: What influence have I had on safety programs during the past year?

Fri.: What safety measures do I now practice?

Sat.: What can I do to further the safety program during the year ahead?

If we can find the answers to these questions, we shall come closer to the cooperation President Eisenhower had in mind in his request.

"FARMING efficiency is many things. It is crops and soils, methods and men. It is machines and electric power. It is the use of adapted plant and seed varieties that will produce big yields and high quality crops. It is good rotations to help maintain and build soil fertility. It is protecting the land against erosion. And it is the wise use of plant food—of fertilizers, of crop residues, of lime and other soil-building aids."—*Ezra Taft Benson.*

Season Average Prices Received by Farmers for Specified Commodities *

Crop Year	Cotton Cents per lb. Aug.-July	Tobacco Cents per lb.	Potatoes Cents per bu. July-June	Sweet Potatoes Cents per bu. July-June	Corn Cents per bu. Oct.-Sept.	Wheat Cents per bu. July-June	Hay [1] Dollars per ton July-June	Cottonseed Dollars per ton July-June	Truck Crops ....
Av. Aug. 1909–July 1914....	12.4	10.0	69.7	87.8	64.2	88.4	11.87	22.55	....
1928.....	18.0	20.0	53.2	118.0	84.0	99.8	11.22	34.17	....
1929.....	16.8	18.3	131.6	117.1	79.9	103.6	10.90	30.92	....
1930.....	9.5	12.8	91.2	108.1	59.8	67.1	11.06	22.04	....
1931.....	5.7	8.2	46.0	72.6	32.0	39.0	8.69	8.97	....
1932.....	6.5	10.5	38.0	54.2	31.9	38.2	6.20	10.33	....
1933.....	10.2	13.0	82.4	69.4	52.2	74.4	8.09	12.88	....
1934.....	12.4	21.3	44.6	79.8	81.5	84.8	13.20	33.00	....
1935.....	11.1	18.4	59.3	70.3	65.5	83.2	7.52	30.54	....
1936.....	12.4	23.6	114.2	92.9	104.4	102.5	11.20	33.36	....
1937.....	8.4	20.4	52.9	78.0	51.8	96.2	8.74	19.51	....
1938.....	8.6	19.6	55.7	69.8	48.6	56.2	6.78	21.79	....
1939.....	9.1	15.4	69.7	73.4	56.8	69.1	7.94	21.17	....
1940.....	9.9	16.0	54.1	85.4	61.8	68.2	7.59	21.73	....
1941.....	17.0	26.4	80.8	92.2	75.1	94.4	9.70	47.65	....
1942.....	19.0	36.9	117.0	118.0	91.7	110.0	10.80	45.61	....
1943.....	19.9	40.5	131.0	206.0	112.0	136.0	14.80	52.10	....
1944.....	20.7	42.0	150.0	190.0	109.0	141.0	16.50	52.70	....
1945.....	22.5	36.6	143.0	204.0	127.0	150.0	15.10	51.10	....
1946.....	32.6	38.2	124.0	218.0	156.0	191.0	16.70	72.00	....
1947.....	31.9	38.0	162.0	217.0	216.0	229.0	17.60	85.90	....
1948.....	30.4	48.2	155.0	222.0	129.0	200.0	18.45	67.20	....
1949.....	28.6	45.9	128.0	214.0	124.0	188.0	16.50	43.40	....
1950.....	40.1	51.7	91.7	173.0	153.0	200.0	16.70	86.50	....
1951.....	37.9	51.1	163.0	304.0	166.0	211.0	19.50	69.30	....
1952.....	36.9	50.0	196.0	331.0	157.0	209.0	21.05	70.00	....
1953									
June.....	31.51	51.0	102.0	398.0	146.9	188.0	16.05	61.20	....
July.....	31.87	51.2	95.5	402.0	147.0	187.0	15.45	59.00	....
August.....	32.77	51.3	91.4	350.0	148.0	186.0	15.85	56.70	....
September...	33.09	57.6	98.9	264.0	150.0	192.0	16.15	51.50	....
October.....	32.46	52.6	89.7	233.0	134.0	194.0	16.45	52.40	....
November...	31.82	42.3	83.4	232.0	133.0	200.0	17.25	53.40	....
December....	30.73	49.2	69.9	246.0	141.0	201.0	18.25	53.00	....
1954									
January.....	30.05	48.3	69.1	253.0	142.0	203.0	19.05	52.00	....
February....	30.42	31.9	65.3	258.0	143.0	206.0	18.95	51.40	....
March.....	31.05	27.3	53.2	252.0	144.0	209.0	18.35	50.50	....
April.....	31.57	....	70.2	268.0	145.0	206.0	18.05	50.80	....
May.....	32.17	58.0	134.0	263.0	147.0	200.0	17.05	51.40	....
Index Numbers (Aug. 1909—July 1914 = 100)									
1928.....	145	200	76	134	131	113	95	152	147
1929.....	135	183	189	133	124	117	92	137	137
1930.....	77	128	131	123	93	76	93	98	128
1931.....	46	82	66	83	50	44	73	40	107
1932.....	52	105	55	62	50	43	52	46	100
1933.....	82	130	118	79	81	84	68	57	90
1934.....	100	213	64	91	127	96	111	146	94
1935.....	90	184	85	80	102	94	63	135	116
1936.....	100	236	164	106	163	116	94	148	108
1937.....	68	204	76	89	81	109	74	87	114
1938.....	69	196	80	79	76	64	57	97	96
1939.....	73	154	100	84	88	78	67	94	98
1940.....	80	160	78	97	96	77	64	96	122
1941.....	137	264	116	105	117	107	82	211	138
1942.....	153	369	168	134	143	124	91	202	178
1943.....	160	405	188	235	174	154	125	231	270
1944.....	167	420	214	216	170	160	139	234	236
1945.....	181	366	205	232	198	170	127	227	240
1946.....	263	382	178	248	212	209	141	319	217
1947.....	257	380	232	248	336	259	148	381	262
1948.....	245	482	222	253	201	226	155	298	253
1949.....	231	459	184	244	193	213	139	192	232
1950.....	323	517	132	197	238	226	141	384	211
1951.....	306	512	233	346	259	239	164	307	269
1952.....	298	500	281	377	245	236	177	310	274
1953									
June.....	254	510	146	453	227	213	138	271	270
July.....	257	512	137	458	229	212	130	262	216
August.....	264	513	131	399	231	210	134	251	221
September...	267	576	142	301	234	217	136	228	159
October.....	262	526	129	265	209	219	139	232	175
November...	257	423	120	264	207	226	145	237	186
December....	248	492	100	280	220	227	154	235	224
1954									
January.....	242	483	99	288	221	230	160	231	271
February....	245	319	94	294	223	233	160	228	233
March.....	250	273	76	287	224	236	155	224	246
April.....	255	...	101	305	226	233	152	225	225
May.....	259	580	192	300	229	226	144	228	279

Wholesale Prices of Phosphates and Potash **

	Superphosphate, Baltimore, per unit	Florida land pebble, 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports [1]	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports [1]	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports [1]	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports [1]
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657
1928	.580	3.12	5.50	.669	.957	26.46	.607
1929	.609	3.18	5.50	.672	.962	26.59	.610
1930	.542	3.18	5.50	.681	.973	26.92	.618
1931	.485	3.18	5.50	.681	.973	26.92	.618
1932	.458	3.18	5.50	.681	.963	26.90	.618
1933	.434	3.11	5.50	.662	.864	25.10	.601
1934	.487	3.14	5.67	.486	.751	22.49	.483
1935	.492	3.30	5.69	.415	.684	21.44	.444
1936	.476	1.85	5.50	.464	.708	22.94	.505
1937	.510	1.85	5.50	.508	.757	24.70	.556
1938	.492	1.85	5.50	.523	.774	15.17	.572
1939	.478	1.90	5.50	.521	.751	24.52	.570
1940	.516	1.90	5.50	.517	.730	24.75	.573
1941	.547	1.94	5.64	.522	.780	25.55	.367
1942	.600	2.13	6.29	.522	.810	25.74	.205
1943	.631	2.00	5.93	.522	.786	25.35	.195
1944	.645	2.10	6.10	.522	.777	25.35	.195
1945	.650	2.20	6.23	.522	.777	25.35	.195
1946	.671	2.41	6.50	.508	.769	24.70	.190
1947	.746	3.05	6.60	.432	.706	18.93	.195
1948	.764	4.27	6.60	.397	.681	14.14	.195
1949	.770	3.88	6.22	.397	.703	14.14	.195
1950	.763	3.83	5.47	.371	.716	14.33	.195
1951	.813	3.98	5.47	.401	.780	15.25	.200
1952	.849	3.98	5.47	.401	.793	15.25	.200
1953							
June	.860	4.28	....	.361	.708	13.44	.176
July	.895	4.28	....	.396	.768	14.72	.193
August	.895	....	....	.396	.768	14.72	.193
September	.895	....	....	.396	.768	14.72	.193
October	.895	....	....	.396	.768	14.72	.193
November	.895	....	....	.396	.768	14.72	.193
December	.895	....	....	.430	.827	16.00	.210
1954							
January	.895	....	....	.430	.827	16.00	.210
February	.895	....	....	.430	.827	16.00	.210
March	.895	....	....	.430	.827	16.00	.210
April	.895	....	....	.430	.827	16.00	.210
May	.895	....	....	.430	.827	16.00	.210
		Index Numbers (1910-14 = 100)					
1928	108	86	113	94	100	109	92
1929	114	88	113	94	101	110	93
1930	101	88	113	95	102	111	94
1931	90	88	113	95	102	111	94
1932	85	88	113	95	101	111	94
1933	81	86	113	93	91	104	91
1934	91	87	110	68	79	93	74
1935	92	91	117	58	72	89	68
1936	89	51	113	65	74	95	77
1937	95	51	113	71	79	102	85
1938	92	51	113	73	81	104	87
1939	89	53	113	73	79	101	87
1940	96	53	113	72	77	102	87
1941	102	54	110	73	82	106	87
1942	112	59	129	73	85	106	84
1943	117	55	121	73	82	105	83
1944	120	58	125	73	82	105	83
1945	121	61	128	73	82	105	83
1946	125	67	133	71	81	102	82
1947	139	84	135	70	74	78	83
1948	143	118	135	67	72	58	83
1949	144	108	128	67	74	58	83
1950	142	106	112	68	75	59	83
1951	152	110	112	72	82	63	83
1952	158	110	112	72	83	63	83
1953							
June	160	119	...	66	74	56	80
July	167	119	...	71	81	61	82
August	167	...	...	71	81	61	82
September	167	...	...	71	81	61	82
October	167	...	...	71	81	61	82
November	167	...	...	71	81	61	82
December	167	...	...	76	87	66	85
1954							
January	167	...	...	76	87	66	85
February	167	...	...	76	87	66	85
March	167	...	...	76	87	66	85
April	167	...	...	76	87	66	85
May	167	...	...	76	87	66	85

Wholesale Prices of Ammoniates **

	Nitrate of soda bulk per unit N	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16–17% ammonia, Chicago, bulk, per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.37	$3.52
1928	2.67	2.30	7.06	6.63	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.61	5.72
1930	2.47	1.81	4.78	4.96	3.79	4.58
1931	2.34	1.46	3.10	3.95	2.11	2.46
1932	1.87	1.04	2.18	2.18	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.67	3.27
1935	1.47	1.15	4.59	3.10	3.06	3.65
1936	1.53	1.23	4.17	3.42	3.58	4.25
1937	1.63	1.32	4.91	4.66	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.76	4.43
1942	1.74	1.41	6.11	5.77	5.04	6.76
1943	1.75	1.42	6.30	5.77	4.86	6.62
1944	1.75	1.42	7.68	5.77	4.86	6.71
1945	1.75	1.42	7.81	5.77	4.86	6.71
1946	1.97	1.44	11.04	7.38	6.60	9.33
1947	2.50	1.60	12.72	10.66	12.63	10.46
1948	2.86	2.03	12.94	10.59	10.84	9.85
1949	3.15	2.29	10.11	13.18	10.73	10.62
1950	3.00	1.95	11.01	11.70	10.21	9.36
1951	3.16	1.97	13.20	10.92	10.18	10.09
1952	3.34	2.09	13.95	11.27	9.72	9.16
1953						
June	3.34	2.28	10.61	11.26	6.62	6.31
July	3.34	2.28	10.34	11.15	6.75	6.14
August	3.34	2.28	10.14	10.95	7.53	6.68
September	3.09	2.28	9.82	11.04	7.51	6.91
October	3.09	2.25	9.73	11.24	7.96	7.75
November	3.09	2.22	9.61	11.24	8.19	8.19
December	3.09	2.22	10.96	11.24	8.50	9.03
1954						
January	3.09	2.22	11.28	11.24	9.26	9.71
February	3.09	2.22	11.20	11.45	9.34	10.02
March	3.09	2.22	11.35	11.70	9.59	10.20
April	3.09	2.22	11.63	12.15	10.32	10.55
May	3.09	2.22	11.40	12.15	11.47	10.74
	Index Numbers (1910-14 = 100)					
1928	100	81	202	188	146	170
1929	96	72	161	142	137	162
1930	92	64	137	141	112	130
1931	88	51	89	112	63	70
1932	71	36	62	62	36	39
1933	59	39	84	81	97	71
1934	59	42	127	89	79	93
1935	57	40	131	88	91	104
1936	59	43	119	97	106	131
1937	61	46	140	132	120	122
1938	63	48	105	106	93	100
1939	63	47	115	125	115	111
1940	63	48	133	124	99	96
1941	63	49	157	151	112	126
1942	65	49	175	163	150	192
1943	65	50	180	163	144	189
1944	65	50	219	163	144	191
1945	65	50	223	163	144	191
1946	74	51	315	209	196	265
1947	93	56	363	302	374	297
1948	107	71	370	300	322	280
1949	117	80	289	373	318	302
1950	112	68	315	331	303	266
1951	118	69	377	310	302	287
1952	125	74	399	319	288	260
1953						
June	125	80	303	319	196	179
July	125	80	295	316	200	174
August	125	80	290	310	223	190
September	115	80	281	313	223	196
October	115	79	278	318	236	220
November	115	78	275	318	243	233
December	115	78	313	318	252	257
1954						
January	115	78	322	318	275	276
February	115	78	320	324	277	285
March	115	78	324	331	285	290
April	115	78	332	344	306	300
May	115	78	326	344	340	305

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and all Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer material‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash**
1928.....	148	152	141	121	87	177	108	97
1929.....	148	150	139	114	79	146	114	97
1930.....	125	140	126	105	72	131	101	99
1931.....	87	119	107	83	62	83	90	99
1932.....	65	102	95	71	46	48	85	99
1933.....	70	104	96	70	45	71	81	95
1934.....	90	118	109	72	47	90	91	72
1935.....	109	123	117	70	45	97	92	63
1936.....	114	123	118	73	47	107	89	69
1937.....	122	130	126	81	50	129	95	75
1938.....	97	122	115	78	52	101	92	77
1939.....	95	121	112	79	51	119	89	77
1940.....	100	122	115	80	52	114	96	77
1941.....	124	130	127	86	56	130	102	77
1942.....	159	149	144	93	57	161	112	77
1943.....	193	165	151	94	57	160	117	77
1944.....	197	174	152	96	57	174	120	76
1945.....	207	180	154	97	57	175	121	76
1946.....	236	197	177	107	62	240	125	75
1947.....	276	231	222	130	74	362	139	72
1948.....	287	250	241	134	89	314	143	70
1949.....	250	240	226	137	99	319	144	70
1950.....	258	246	232	132	89	314	142	72
1951.....	302	271	258	139	93	331	152	76
1952.....	288	273	251	144	98	333	158	76
1953								
June.....	259	260	246	135	102	253	160	70
July.....	259	261	248	138	102	252	167	75
August....	258	262	249	139	102	261	167	75
September.	256	259	249	137	97	258	167	75
October...	250	258	248	137	96	265	167	75
November.	249	259	247	137	96	267	167	75
December..	254	260	248	141	96	285	167	80
1954								
January...	259	263	250	142	96	300	167	80
February..	258	264	248	142	96	301	167	80
March....	256	264	250	143	96	307	167	80
April.....	257	265	250	145	96	323	167	80
May.....	258	267	250	147	96	338	167	80

* U. S. D. A. figures, revised January 1950. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] Beginning July 1949, baled hay prices reduced by $4.75 a ton to be comparable to loose hay prices previously quoted.

[2] All potash salts now quoted F.O.B. mines only; manure salts since June 1941, other carriers since June 1947.

**** Where range of prices for fertilizer material is quoted, average figure is used. The weighted average of prices actually paid for potash is lower than the annual average because since 1926 over 90% of the potash used in agriculture has been contracted for during the discount period. The maximum discount is now 16%. Applied to muriate of potash, a price slightly above $.353 per unit K_2O thus more nearly approximates the annual average than do prices based on arithmetical averages of monthly quotations.**

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Commercial Fertilizers, Report for 1953," Agr. Exp. Sta., New Haven, Conn., Bul. 579, Feb. 1954, H. J. Fisher.

"Effect of Rotations, Fertilizers, Lime and Green Manure Crops on Crop Yields and on Soil Fertility," Agr. Exp. Sta., Univ. of Fla., Gainesville, Fla., Bul. 522, Aug. 1953, L. G. Thompson, Jr. and W. K. Robertson.

"Fertilizing The Lawn," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., Landscape Gardening No. 8, H. R. Kemmerer and F. F. Weinard.

"Commercial Fertilizers in Kentucky, 1953," Agr. Exp. Sta., Univ. of Ky., Lexington, Ky., Reg. Bul. 111, March 1954.

"Fertilizers And Limes—1953," Agr. Exp. Sta., Rutgers Univ., New Brunswick, N. J., Insp. Series, 52, Feb. 1954, S. B. Randle.

"Results Of Fertilizer Demonstrations With Spring Planted Crops—1953 Oklahoma," Agr. Ext. Serv., Okla. A. & M. College, Stillwater, Okla., Cir. 611

"Inspection Of Fertilizers," Agr. Exp. Sta., Univ. of R. I., Kingston, R. I., Ann. Fertilizer Cir., Nov. 1953, R. W. Gilbert and C. E. Olney.

"Know Your Fertilizers," Agr. Ext. Serv., Texas A. & M. College, College Station, Texas, C-307, M. K. Thornton.

"Fertilizer Recommendations for the Lower Rio Grande Valley," Agr. Ext. Serv., Texas A. & M. College, College Station, Texas, C-311, Nov. 1953, M. K. Thornton, J. E. Hutchinson, and W. R. Cowley.

"Fertilizer Recommendations for the Upper Rio Grande, El Paso, Pecos, and Van Horn Irrigated Areas," Agr. Ext. Serv., Texas A. & M. College, College Station, Texas, C-312, Nov. 1953, M. K. Thornton, J. E. Hutchison, and P. D. Christensen.

"Fertilizer Recommendations for the Blackland Prairie, Grand Prairie, and Eastern Part of Edwards Plateau," Agr. Ext. Serv., Texas A. & M. College, College Station, Texas, C-314, Nov. 1953, M. K. Thornton, J. E. Hutchison, R. M. Smith, and D. I. Dudley.

"Fertilizer Recommendations for the High Plains," Agr. Ext. Serv., Texas A. & M. College, College Station, Texas, C-315, Nov. 1953, M. K. Thornton, J. E. Hutchison, and D. L. Jones.

"Small Grain Fertilizer Tests On Houston Soils Of North-Central Texas, 1949-52," Agr. Exp. Sta., Texas A. & M. College, College Station, Texas, Prog. Rpt. 1608, April 19, 1954, C. O. Spence, A. A. Baltensperger, and D. I. Dudley.

"Small Grain Fertilizer Tests In North-Central Texas, 1952-53," Agr. Exp. Sta., Texas A. & M. College, College Station, Texas, Prog. Rpt. 1669, April 19, 1954, A. A. Baltensperger, C. O. Spence, and D. I. Dudley.

Soils

"Significance of Sand and Gravel in the Classification, Mapping and Management of Some Coarse-Textured Soils," Agr. Exp. Sta., New Haven, Conn., Bul. 580, Jan. 1954, C. L. W. Swanson and A. Ritchie, Jr.

"The Garden Compost Pile," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., Vegetable Growing No. 1, B. L. Weaver.

"Testing Lawn and Garden Soils," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., Landscape Gardening No. 12, H. R. Kemmerer and F. F. Weinard.

"Explanation of Soil Test Recommendations," Agr. Ext. Serv., Iowa State College, Ames, Iowa, Agron. 110-E, April 1953, J. Hanway.

"How to Take Good Soil Samples," Univ. of Ky., Lexington, Ky., Leaf. 139, June 1953, G. D. Corder.

"Equipment and Procedures for Efficiency and Flexibility in Soil Testing Laboratories," Agr. Exp. Sta., Univ. of Maine, Orono, Maine, Misc. Pub. 623, Oct. 1953, P. N. Carpenter.

"Soils of Moniteau County, Missouri," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., Bul. 601, July 1953, J. A. Frieze and C. L. Scrivner.

"Managing Irrigated Pastures," Agr. Ext. Serv., N. D. State College, Fargo, N. D., Cir. A-195, June 1953, D. J. McLelland.

"Test Your Soil," Agr. Ext. Serv., Univ. of Vt., Burlington, Vt., Brieflet 927, April 1954, W. A. Way.

"Estimation of Available Phosphorus in Soils by Extraction With Sodium Bicarbonate," USDA, Wash., D. C., Cir. 939, March 1954, S. R. Olsen, C. V. Cole, F. S. Watanabe, and L. A. Dean.

"Diagnosis and Improvement of Saline and Alkali Soils," USDA, Wash., D. C., Agr. Handbook No. 60, Feb. 1954.

Crops

"Some Effects of Sawdust Mulching of Pine Seedlings," Agr. Exp. Sta., Ala. Polytechnic Institute, Auburn, Ala., Leaf. 42, 1954, H. G. Posey and J. T. May.

"Silage, Corn and Sorghum," Agr. Ext. Serv., Univ. of Ark., Fayetteville, Ark., Leaf. 187, April 1953, W. R. Perkins and W. H. Freyaldenhoven.

"Nut Culture In Ontario," Hort. Exp. Sta., Vineland Station, Ont., Canada, Bul. 494, Sept. 1952, W. J. Strong.

"Winter Wheat Improvement In Ontario, Eleventh Annual Report," Agr. College, Guelph, Ontario, Canada, April 1954, W. H. Wadell.

"Prog. Rpt. 1948-1952, Dominion Experimental Farm, Agassiz, British Columbia," Canada Dom. Expl. Farm, Ottawa, Ont., Canada, Feb. 1954, W. H. Hicks.

"Prog. Rpt. 1948-1952, Beaverlodge, Alberta," Canada Dom. Expl. Sta., Ottawa, Ont., Canada, Oct. 1953, E. C. Stacey.

"Better Peach Trees With Cover Crops," Agr. Exp. Sta., Univ. of Del., Newark, Del., Cir. 28, Jan. 1954, C. W. Hitz.

"Amaryllis In The Home," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., Flower Growing No. 4, G. M. Fosler.

"Seed Germination Made Easy," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., Flower Growing No. 8, G. M. Fosler.

"Sansevierias—Their Culture And Use," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., Flower Growing No. 11, G. M. Fosler.

"Keeping The Lawn Attractive," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., Landscape Gardening No. 6, H. R. Kemmerer and F. F. Weinard.

"Starting A New Lawn—2, Preparation of the Seedbed," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., Landscape Gardening No. 10, H. R. Kemmerer and F. F. Weinard.

"Lawn Seed Mixtures," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., Landscape Gardening No. 11, H. R. Kemmerer and F. F. Weinard.

"What's Wrong With Your Lawn?" Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., Landscape Gardening No. 13, H. R. Kemmerer and F. F. Weinard.

"Renovating Your Lawn," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., Landscape Gardening No. 14, H. R. Kemmerer and F. F. Weinard.

"Transplanting Large Trees," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., Landscape Gardening No. 15, H. R. Kemmerer.

"Popcorn," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., Vegetable Growing No. 2, B. L. Weaver.

"A Report On Your Extension Program," Agr. Ext. Serv., Purdue Univ., Lafayette, Ind., 40th Ann. Rpt.

"Building Productive Pastures," Agr. Ext. Serv., Iowa State College, Ames, Iowa, Pamph. 211, Dec. 1953, J. M. Scholl, H. D. Hughes, R. Krenzin, and E. P. Sylwester.

"Growing Pickle Cucumbers," Agr. Ext. Serv., Univ. of Ky., Lexington, Ky., Leaf. 135, Dec. 1952, J. S. Gardner.

"Starting and Managing Permanent Pastures in Kentucky," Agr. Ext. Serv., Univ. of Ky., Lexington, Ky., Leaf. 137, Jan. 1953, E. N. Fergus.

"1953 Silver Anniversary Report, Northeast Louisiana Experiment Station," Agr. Exp. Sta., La. State Univ., Baton Rouge, La.

"Forage Mixtures," Agr. Ext. Serv., Univ. of Minn., St. Paul, Minn., Ext. Fldr. 182, April 1954, A. R. Schmid, R. A. Briggs, H. E. Jones, and R. E. Bennett.

"Grape Growing In New Jersey," Agr. Ext. Serv., Rutgers Univ., New Brunswick, N. J., Ext. Bul. 268, Jan. 1954, E. G. Christ.

"Better Lawn Seed Mixtures," Agr. Ext. Serv., Rutgers Univ., New Brunswick, N. J., Leaf 114, Nov. 1953, R. E. Engel and G. H. Ahlgren.

"Field Crop Recommendations, 1954," Agr. Ext. Serv., Rutgers Univ., New Brunswick, N. J., Leaf 115, Dec. 1953, J. E. Baylor.

"Vegetable Plants From Seedbed to Field," Agr. Ext. Serv., Rutgers Univ., New Brunswick, N. J., Leaf. 118, March 1954, C. H. Nissley.

"Making A New Lawn," Agr. Exp. Sta., Rutgers Univ., New Brunswick, N. J., Cir. 556, April 1954, R. E. Engel and G. H. Ahlgren.

"Grow Winter Rye for Better Weed Control," Agr. Ext. Serv., N. D. Agr. College, Fargo, N. D., Cir. A-199, Aug. 1953, R. B. Widdifield.

"Ohio MR25 . . . A Pickling Cucumber Highly Tolerant To Mosaic," Agr. Exp. Sta., Wooster, Ohio, Res. Cir. 25, May 1954, J. D. Wilson, C. A. John, and F. Myrice.

"The Value of Prairie Hay for Milk Production," Agr. Exp. Sta., Okla. A. & M. College, Stillwater, Okla., Bul. B-423, May 1954, M. Ronning and A. H. Kuhlman.

"The Milton Early Italian Prune," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Cir. of Inf. 536, Feb. 1954, Q. B. Zielinski and J. A. Milbrath.

"Peach Varieties For Oregon," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Bul. 541, April 1954, Q. B. Zielinski.

"Stone Valley Experimental Forest," Agr. Exp. Sta., Pa. State Univ., State College, Pa., Prog. Rpt. 117, April 1954.

"Salesmen of Science," Agr. Ext. Serv., Univ. of R. I., Kingston, R. I., Bul. 152, Ann. Rpt. 1952, July 1953.

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Ruth was a bit envious. "What's this I hear," she asked, "about your having a seductive perfume to snare the men?"

"That's right," Grace answered. "I cook corned beef and cabbage for them."

"What kind of pies you got?" said the man in a restaurant.

"I've dust dot abble and cherry left," replied the husky-voiced waitress.

"You got laryngitis?"

"No—dust abble and cherry."

Potash Pays on Forage . . .

(*From page* 10)

from 81 to 69% ladino clover. From October 1951 (end of second crop year) to the spring of 1952, the ladino dropped from 69 to 30%.

TABLE II.—POTASH IN POUNDS K_2O PER ACRE REMOVED IN FIRST AND SECOND HARVEST YEAR BY LADINO CLOVER AT LOW AND HIGH LEVELS OF APPLIED K_2O.

Harvest year	Low K_2O		High K_2O	
	Applied	Removed	Applied	Removed
First.....	0	67	200	102
Second...	0	26	150	75

All plots received 100 pounds K_2O when seeded.

From these observations the following conclusions may be made: (a) Ladino clover maintains itself well during the first crop year if adequately fertilized at seeding time, but the K content drops rapidly (2.3% to 1.5% in three cuttings) and the ladino clover plants "go out" in the winter and early spring after the readily available potassium has been depleted (Table II); (b) on a low K fertility level the ladino clover was low in K content and was unable to survive the winter with sufficient vigor to compete with the incoming bluegrass and bent grass; and (c) on a high K fertility level (150-200 pounds K_2O per acre) ladino clover stands were maintained without serious decline until the third year.

During the spring of 1952 a marked decrease in the stand of ladino clover occurred on the highest potash plots. This decrease may be attributed to the rapid growth of the weedy grasses, bent grass and Kentucky bluegrass, during the cool spring months. It is thus evident that even with high potash fertilization the ingress and dominance by the weedy grasses cannot be entirely prevented if they are not completely eradicated before seeding the ladino clover.

Timothy

The influence of a low potash level on timothy stands the first crop year was similar to that on ladino clover. Little or no reduction in per cent timothy was observed on low K plots until after the first year, but from then on there was a rapid and continuous reduction. The per cent K in timothy dropped from 1.4 in the first cutting to 0.8 in the second cutting on the low K plots. When K as well as P was maintained at a high level, the timothy stands persisted until the third season. There was a marked reduction during the third season due principally to the increase in bent grasses after the first cutting. Timothy plants on low K plots were stunted, lacked vigor, and the leaves showed severe K deficiency symptoms.

Timothy produces very heavy forage yields in the first cutting, and very little second growth is produced. This characteristic of timothy is thought to be responsible in part for the relatively short life of the stand at high fertility levels. Certainly there is little competition offered by timothy to the weedy grasses during the summer and fall period following this large first cutting.

Orchard Grass and Brome Grass

The influence of potash on orchard grass and brome grass was similar. As with ladino clover and timothy, no apparent effect of reduced K level was observed the first year on the yield and stand of orchard grass and brome grass. The per cent K dropped from 2.3 in the first cutting to 1.2 in the third for

orchard grass and from 1.7 to 1.3 in the second cutting for brome grass. The decline in stand of orchard and brome grass after the first season, however, was continuous but not so rapid as with ladino and timothy. At the low K level, orchard and brome grass yields and stands were greatly reduced during the third crop year. Plants on low K lacked vigor, were much smaller, and showed severe K deficiency symptoms on the leaves. At high K levels (adequate phosphorus), orchard grass and brome grass accounted for more than 90% of the stands at the first cutting in the third year. Thus, these two grasses—orchard and smooth brome—when supplied adequate amounts of N, P, and K are considered to be better competitors than timothy against weedy grasses. The rate of recovery and continuous nature of plant growth are certainly important factors in this competition. In contrast to timothy, orchard grass and brome grass characteristically produce much more aftermath than timothy throughout the summer and fall and thus offer greater competition to weedy grasses for light and moisture as well as for plant nutrients. At low K this is especially true of orchard grass and to a lesser extent of brome grass as shown by the per cent of stand remaining at the end of the third crop year (31% for orchard grass, 11% for brome grass, and 3% for timothy).

When adequate K was supplied, both orchard grass and smooth brome grass maintained good stands during the third year, and neither bent grass nor Kentucky bluegrass populations made important increases. This may account for the fact that both smooth brome grass and orchard grass are desirable companion grasses with ladino clover. Orchard and brome grass may be beneficial to ladino by reducing the establishment of the weedy grasses, bent grass, and Kentucky bluegrass, which are serious K competitors with it.

This soil contained 40 pounds Truog phosphorus and over 2,000 pounds "fixed" phosphorus per acre. Yield increases produced by rates of superphosphate were small. The efficiency of P removal in three years by the forage crops was important, equal to 183, 170, 138, and 113% of the applied 50 pounds P_2O_5 by orchard, brome, timothy, and ladino, respectively. It is evident that under the systems of management used with high N and K fertilization, the grasses studied were able to utilize appreciable amounts of "fixed" soil phosphorus. By the end of the third harvest year, the P content of the grasses grown on the 50-pound P_2O_5 plots had decreased. This decrease in P content and P removal indicated that on this and similar soils 50 pounds P_2O_5 are not adequate for three years' production of the forage grasses studied.

Practical Application of the Results

During the second and third year of this experiment it became apparent that Kentucky bluegrass and bent grasses were serious weed pests under the conditions studied. Also, it was apparent that the ingress of these weedy grasses was due, in large part, to stolons and underground rootstocks which were present before seeding time. Both of these weed pests are perennials and they produce rhizomes or stolons which are very difficult if not impossible to destroy by ordinary cultural practices. Unless all portions of these weedy plants are killed before seeding, vigorous growing stands of ladino clover will be unable to persist for more than two to three years. Frequent potassium applications that keep the supply of this element high will aid in extending the life of a ladino stand under these conditions but will not prevent the eventual dominance of weedy grasses.

Considering the efficiency with which improved forage grasses remove potassium from the soil, it was not possible to build up the reserves of this element in this soil. This factor, in addition to species competition for potassium and the absorption of luxury amounts of

soluble K, points to the desirability of making split applications of K fertilizer. Two, preferably three (one after each of three cuttings), applications of 50 to 75 pounds K_2O per acre are desirable for the faster growing improved forage species such as ladino clover, orchard grass, and smooth brome grass.

The high P and K removal by orchard, brome, and timothy shows that liberal applications of both phosphate and potash fertilizers are a must for a successful grassland agriculture on most soils of the Northeast.

Fertile Soils—Less Erosion

FERTILE soils suffer less from erosion than infertile soils. The healthy soils absorb rain water faster and in greater quantities because they are more porous, say soils specialists at the University of Wisconsin.

Fertile soils grow bigger crops which help cut down erosion in several ways. The heavier the crop growth, the more wind and water are slowed. These are the two greatest causes of soil erosion.

Crops also protect the soil against pounding action of rain. Rain hitting bare ground will cause the tiny soil particles to run together and actually seal the surface of the soil, keeping the water from soaking in. Plant roots also bind the soil and hold it in place. Organic matter in the soil makes it more open and helps hold more water. Crops return this organic matter to the soil as they rot.

Lastly the crops themselves use water. A ton of alfalfa will use six inches of rain, making enough room right in the soil for that much more water.

Water is a natural resource just as soil. When water runs off, it not only causes erosion, but is a resource loss, the soils men conclude.

Cover Crops for Peach Trees

PEACH trees grow best when treated to a vigorous winter cover crop. That is the conclusion from a 10-year study of southern Delaware peach orchards, made by the University's Agricultural Experiment Station.

The most satisfactory winter cover crop was a mixture of 70 pounds of rye and 30 pounds of vetch. Sowed September 1 and disced under in mid-May, this treatment encouraged good tree growth. It also reduced competition for moisture and nutrients—important during the growing season.

Halehaven was the peach variety used in the research, carried on at the Agricultural Substation in Georgetown. Twelve different treatments on 384 trees with various combinations of winter and summer cover crops all indicated that a tree will grow better with some cover than with constant clean cultivation.

Results also showed that the soil should be well fertilized before sowing a cover crop. In this case, 300 pounds of a 2½-10-10 fertilizer were applied each year to the area sown to rye-vetch.

In general, the treatments that gave the best tree growth the first five years also resulted in the largest trees at the end of the experiment. These trees also produced the most fruit.

Fertility Increases Efficiency . . .

(*From page* 12)

early August, some water in addition to that measured was extracted from the soil.

Increased Root Growth

Research studies[1] have shown that the root development under fertilized crops is greater in amount and penetrates to greater depths. Thus, corn grown on plots with full treatment had the root development sufficient to take water at a greater rate, and since its roots penetrated to greater depths it had a greater supply available from which to draw water than was the situation for the shallow-rooted corn on the unfertilized soil. On August 17 only one inch of available water remained in the 42 inches of soil under the fertilized corn. Under the unfertilized corn there were 4½ inches of available water in the same depth.

The corn on the soil with full treatment was grown in a rotation of corn-wheat-2 years meadow, with grain and hay crops removed. Average yields for the last 6 years were: corn, 100 bushels; wheat, 23 bushels; and hay, 2.1 tons per acre. Corn on the unfertilized soil was in a rotation of corn-oats with only grain removed. The removal of nutrients by the crops of this latter rotation has not been high since the yields during the last 6 years have averaged only 23 bushels of corn and 6 bushels of oats per acre. This same 2-year rotation, but on soil with full treatments and sweet clover for green manure, has averaged 98 bushels of corn and 37 bushels of oats per acre. The yield increase in bushels per acre was not the only difference in favor of full treatment. Corn in both the 2- and 4-year rotations on soil with full treatments shelled 79 per cent grain, whereas on the untreated soil it shelled only 70 per cent grain.

For full treatments on these plots, 5 tons lime, 1,000 pounds rock phosphate, 100 pounds muriate of potash were required. Also, 300 pounds 3-12-12 starter per acre plus 100 pounds nitrogen on the 4-year system corn and 66 pounds nitrogen on the 2-year system corn with the sweet clover plowed under were used. After the first round of the rotation, additional potash and phosphate were required. The 4-year rotation with 2 years of hay required more additional potash and phosphate than did the 2-year rotation with only grain removed.

Lost in Runoff

Nearly one inch of the scant supply of rainfall during the past season was lost in runoff from the plot in corn on untreated soil, whereas with full treatment the loss was only ¼ this amount.

The average rainfall during the corn season for the last 6 years has been 19.84 inches. Of this amount, 2.72 inches appeared as runoff, which caused 2.25 tons per acre erosion under corn on untreated soil. With full treatment and the 2-year system, runoff was 0.88 inch and erosion 0.85 ton per acre; with the 4-year system runoff was 0.60 inch and erosion 0.56 ton per acre.

The full soil treatments have been effective in creating conditions that reduce runoff and erosion and they have substantially increased crop yields. By developing a more dense and a deeper root system, the effective reservoir in the soil from which water could be withdrawn in times of drought was increased, thus providing for the increased amount of water required for high yields.

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[1] Strong Roots Make High Corn Yields, H. J. Snider. Better Crops With Plant Food, Vol. XXXVII, No. 7, pp. 17-19.

Surveying California Citrus . . .

(*From page 22*)

Leaf analysis values for potassium in the San Diego County lemon grove survey are charted in Fig. 4. The percentage of samples with leaf potassium falling below 0.51% K in the Escondido area was about 8%, in the El Cajon area 11%, and in the Fallbrook area 22%. This noticeably greater percentage of samples falling below 0.51% in the leaves in the Fallbrook area groves may well be due to the phosphorus fertilizer applications made quite generally in this area a few years prior to the survey. The phosphorus fertilizer program without accompanying potassium fertilizer applications may be causing the lower levels of leaf potassium in these groves. It is quite probable that lemon groves showing the low leaf potassium in this range (0.50% K and below) will respond to applications of potassium fertilizer. About 48% of the total leaf samples taken in this survey fell into the 0.51% to 0.70% K range. From a limited amount of field plot work accomplished thus far, it is felt that some lemon groves within this range will respond to potassium fertilizer applications.

More extensive field plot studies with potassium fertilizer on lemon groves showing leaf readings in the lower range are now being conducted. In these studies leaf analyses will be made concurrently with the collection of data on yield, fruit size, and citric acid content.

Summary

Examination of the data now available from a number of sources indi-

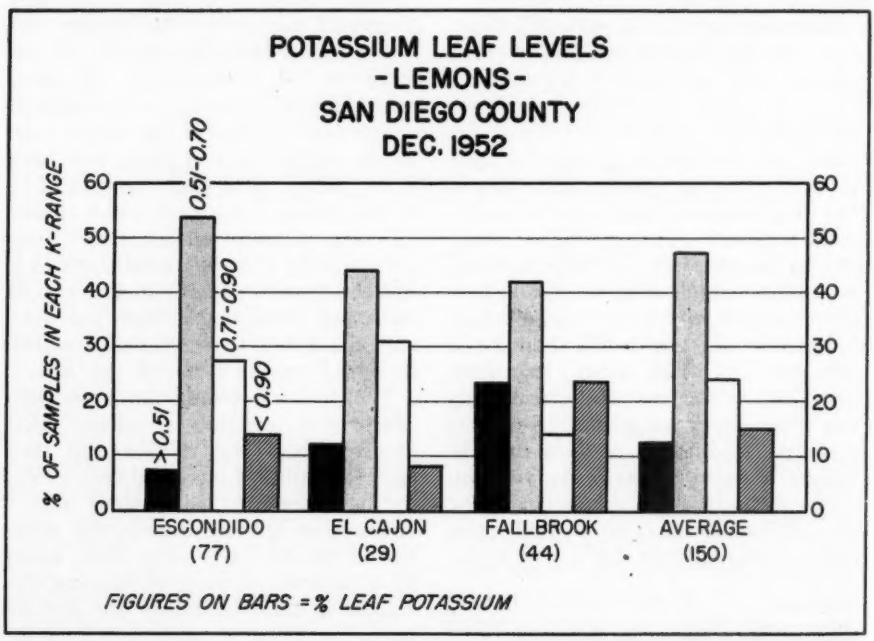

Figure 4

cates in the case of oranges that:

1. Phosphorus leaf levels of less than 1,000 ppm. or 0.10% have been mentioned as indicating phosphorus deficiency. About 18% of the orange groves sampled fell within this zone of possible deficiency, Ventura County showing the highest percentage (37%) in this category.
2. Potassium leaf levels below 0.60% potassium are in a range where some type of benefit from potassium fertilizer application is a good possibility, and if the leaf level falls below 0.40% potassium some visual disturbances in the tree may even be observed.
3. A relatively high percentage (35%) of the groves sampled in the survey fell below this leaf potassium level of 0.60%.

In the case of lemons, indications are that:

1. Phosphorus leaf levels of 0.08% P or below are associated with abnormal foliage conditions on the trees and reduced yields, and in these cases phosphorus fertilizer applications are quite likely to greatly increase yield and improve tree condition.
2. In the San Diego County survey, 7% of the groves sampled showed leaf phosphorus levels of 0.08% P or below, at which need for phosphorus fertilizer is quite definite, and 26% of the groves fell in the range 0.081-0.100% P within which it is probable that some response to phosphorus fertilizer application may be obtained.
3. Samples with leaf potassium levels of 0.50% K or below were found to comprise about 11% of all samples in the survey and in the Fallbrook area 22% of the leaf samples were in this low range, probably due to previous use of phosphorus fertilizers and omission of potassium fertilizer.
4. In lemon groves with leaf potassium levels of 0.50% K or below, the probability of response to potassium fertilizer is good, especially if any phosphorus need is first met.

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Mister Motorist . . .

(*From page* 5)

either direction chalked up 2,760 deaths and 170,000 injuries in 1952, while the sorrow sums for 1953 were 3,160 deaths and 177,000 injuries during a turning period. Skidding cases increased last year over 1952, being the reason for 2,120 deaths and 62,000 injuries. It may be interesting to observe that figures show deaths in car collisions where one of the vehicles was stationary or parked by the roadside amounted to 1,500 in 1952 and 1,120 in 1953. This may have cut the smash force and may not have put quite so many persons in hazard, but it's not happy to contemplate except as a salvage job for some garage.

We build superhighways and put a multitude of signs and cogent warnings on them. We spend public funds to make roads straight and safe at turns and crossings. Yet the casualties mount higher on these roads than they do on curving country lanes and obscure and poorly marked spots. The only answer

to that situation is reduced speed and careful driving all the way all the time.

Now take the weather conditions. Statistics show that in rain, fog, and snow about 18 per cent of the 1953 highway deaths occurred and about 20 per cent of the non-fatal cases. That left 82 per cent of the deaths and 80 per cent of the injury cases taking place on clear, bright days of excellent vision and good surface conditions. Inasmuch as so many happy families choose nice days to make visits or go on picnics, this is not so pleasant to think about either.

ALERT and purposeful folks in our rural areas are trying their level best to make funeral processions and hospital visits less of a necessary end to motor transportation and motor power in general. Extension engineers and educators and the rousing local efforts of village chambers of commerce and Future Farmer chapters try to focus attention on the problem in all its aspects.

These forces try to call attention to the constant need for careful checking of both the drivers and the automobiles and trucks. Some of them even join police and other safety people in conducting regular systematic observations of the mechanical conditions of vehicles and pointing out threats hidden under the hood or in the brakes or the steering wheel connections. That they are doing and will continue to do worthwhile, noteworthy service is not gainsaid. But we always come back to the original question that puzzles us all—is that going to be enough?

Familiarity breeds contempt. We who live in this rushing age and have wide command of such mighty instruments of power are lulled into a coma of indifference. Back there when we first began to handle the wheels and throw the clutches and pedal the gas we were rather timid and deliberate about it all. We had so many, many years behind us of nothing but horsepower in the flesh and sinew of drafters and trotters—or in patient oxen, or stubborn mules—that we passed into the era of internal combustion horsepower with some misgivings and a lot of respect for it.

THEN, of course, our highways were muddy and rough and gravelly. Hills were steep and curves long and winding, masked in trees and brush. No smart windshield wipers and cloth-waving station attendants were near at the next crossroad to inspect us and check our equipage and the state of the nation in general. The country stores carried no kegs of beer or flagons of whoop-te-doo to quench our thirst and add new zip to our nerves for the rest of the journey. I'll say conditions were different in the days of the tin lizzie and its breathless haste at 20 miles per.

Naturally, there must have been numerous accidents even in those primitive times of transportation in motor vehicles, but inasmuch as the horsepower was very much lower and the roads seldom invited speed anyhow, a few bruises and contusions and missing false teeth and eyeglasses were the usual extent of the damage. As I recall it, the only real private car racing that went on was on the elapsed time basis. I had an uncle who ran his gilt-trimmed, high-seated Reo on a pacing excursion from our largest city to the state capital city. The distance of 90 miles was made by him in eight hours. He was required by the rules to stop and register at a designated livery stable in every other hamlet he rattled through. Had these kind and cooperative liverymen been consulting their crystal globes they might have turned down the invitation by the motor club to keep tally on the deal. Eventually all the traveling men forgot about their favorite driving nags and phaetons and stopped no longer to pick up some farmer's daughter along the dusty roads to show off the glory of their equine ensemble.

Another vital reason why the original devotees of the motor car seldom

crashed or smashed in a complete fashion was that riding therein in those pioneer days was a wearisome undertaking. After a few miles of relaxing and vigorous outdoor enjoyment, a tire went flat, or some dashed-ding engine bother broke out, or the lights went bad at twilight in the uncertain acetylene systems then prevailing. The roads were seldom very well marked. That meant stopping at almost every country crossroad to inquire if there were any "best" roads to somewhere. All this elementary business deprived the sly demon of speed mania from taking a strange hold on the chap in linen duster who grimly grasped the high steering lever. His generation never had any incentive or stimulus to "step on her hard."

Then we mustn't overlook the bicycle. Back then the only real road-burners were those who mounted the bicycles and did their own accelerating with foot power and leg muscles. Of course, a good share of their locomotion was pushing their bikes up some hill or carrying them across some marshy places. That took the tuck out of roadsters plenty and set no stage for a general spurt into the tantalizing realm of speeding. It helped fix more firmly the attributes of slow motion and relative freedom from spills and thrills via the harnessed quadrupeds.

SO today we have at least three generations who were born too late to be cautious. They can't assimilate some experiences shared by their elders in matters of getting there without undue chance of extermination. About the only classic of their elders' time that had any remote relation to the horse-and-buggy era's dangers was De Quincy's famous essay on "A Vision of Sudden Death." Compare the carnage of that dramatic incident on the road with the slaughter in the "Charge of the Light Brigade" and you at once see clearly what the situation was. Old-timers then felt reasonably safe in the vehicles of the day and regarded a

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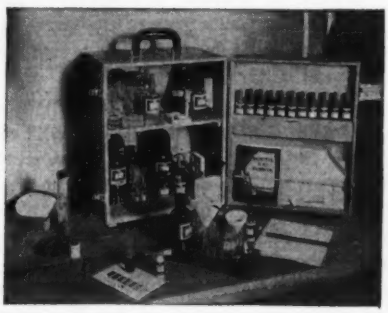

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cavalry charge or a duel of artillery as far more apt to cause sudden death.

But not so today. I imagine the average conscript and recruit for field service has about as good or better chance to escape death than the family man and his dear ones starting on a happy journey behind the tumultuous modern automoble. As the common comment runs: "That shouldn't happen to a dog."

TO respect and fear any power is getting to be a sort of lost art. That seems to go with religion too, I might add, and perhaps it has a much closer tie than we imagine to what happens to the careless ones. I earnestly feel that when one loses that amazement and awe over anything fresh and new and untried and novel which so many of our elders had, we at once acquire the germs of mania and recklessness.

Probably the virus is lodged in the mental structure of our youngsters almost at birth—or anyhow at first consciousness of events. They take their rides in motor cars instead of baby carriages and some of them inadvertently are actually born in taxicabs.

Hence to lay grave charges entirely at the whirlwind careening flings of gaudy youth and their accident toll on the highways, we ought to realize that we brought them up with one hand on the wheel and both feet on the accelerator—both physically and spiritually.

I think I have seen a few of these juvenile comic spreads in booklet form that try to tackle the safety subject, and against tough odds, try to preach caution and moderation to the juvenile drivers. But over and against them are "space flyers" and distance destroyers of many kinds with weird and exciting tales to unfold in bedtime stories and Sunday newspapers.

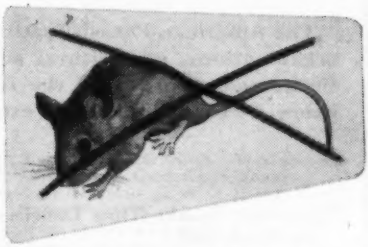
At the other extreme in age classes are the sixtyish and older persons who insist on testing their reflexes on public roads, much to the hazard of the traffic in general. These persistent codgers have a none too good statistical record. All youth under 18 years caused about 4 per cent of the 1953 auto deaths and 3 per cent of non-fatal accidents. Yet persons driving at 65 or over have 2,330 deaths and 60,000 accidents, or a slightly higher percentage of the total last year than the teen-agers. Youth from 18 to 24 years of age, however, beat both these other classes for casualties. They account for 21 per cent of the highway killings and 17 per cent of the injuries.

These older parties lived through the age of slow motion, to be sure, but it's their physical infirmities rather than their criminal carelessness as such that lands so many of them upside down. To "know your own strength" is important, but to realize your weakness is safer for all concerned. I have a grudge against the fellow of my age class who clings to the wheel because he hates to admit that he's a public nuisance behind a public risk. Besides, it's easier to let a competent driver do all the work and let you relax and scan the scenery, including the pretty gals.

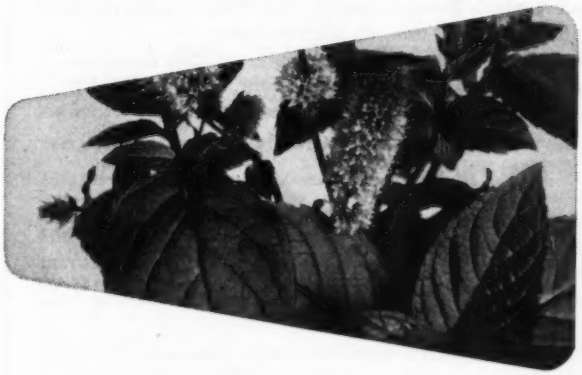
IN summing up the case, one authority puts it this way: "Violation of the rules of the road is a prelude to disaster, and so are gross carelessness and the wilful abuse of highway etiquette. Though it is not our function to analyze or moralize more deeply, the conclusion is obvious. In most accidents, the guilty party is man and not machine, mind and not motor, reflex and not roadway."

As vacations begin in our broad land, let's be strict and cautious ourselves, and pray hard that the other fellow with too much booze and too little brains doesn't happen along the highway at the same time as we do. We can keep on trying to stop them from turning the glory road into a gory one.

What's new in Naugatuck *



PHYGON® promises more benefits – as rodent repellent



...mint fungicide

As a seed protectant, Phygon has delivered many marketable benefits to growers of alfalfa, beets, corn, peas, pepper, rice, sorghum, spinach, swiss chard, tomatoes. Now, according to U.S. Fish and Wildlife Service, stored Phygon-treated seed has mouse-resistant properties.

As a fungicide, Phygon-XL has proved equally successful in improving such crops as apples, peaches, cherries, tomatoes as well as many ornamentals. Now it has solved a long-standing peppermint oil problem by providing excellent control of mint rust *without leaving undesirable residue in the oil extract.*

Naugatuck is proud of these two new additions made to Phygon's remarkably versatile list of accomplishments.

* One in a series of advertisements demonstrating Naugatuck's continuing effort to introduce new and better products for agricultural and related uses.

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ELM STREET, NAUGATUCK, CONNECTICUT

producers of seed protectants, fungicides, miticides, insecticides, growth retardants, herbicides: Spergon, Phygon, Aramite, Synklor, MH, Alanap.

FREE LOAN OF EDUCATIONAL FILMS

The American Potash Institute will be pleased to loan to educational organizations, agricultural advisory groups, responsible farm associations, and members of the fertilizer trade the motion pictures listed below. This service is free except for shipping charges.

FILMS (ALL 16 MM. AND IN COLOR)

The Plant Speaks Thru Deficiency Symptoms (Sound, running time 25 min. on 800-ft. reel.)

The Plant Speaks, Soil Tests Tell Us Why (Sound, running time 10 min. on 400-ft. reel.)

The Plant Speaks Thru Tissue Tests (Sound, running time 14 min. on 400-ft. reel.)

The Plant Speaks Thru Leaf Analysis (Sound, running time 18 min. on 800-ft. reel.)

Save That Soil (Sound, running time 28 min. on 1200-ft. reel.)

Borax From Desert to Farm (Sound, running time 25 min. on 1200-ft. reel.)

Potash Production in America (Sound, running time 25 min. on 800-ft. reel.)

In the Clover (Sound, running time 25 min. on 800-ft. reel.)

In Canada: The Plant Speaks Thru Deficiency Symptoms
The Plant Speaks, Soil Tests Tell Us Why
The Plant Speaks Thru Tissue Tests
The Plant Speaks Thru Leaf Analysis
Borax From Desert to Farm
Potash Production in America

DISTRIBUTORS

Northeast: Educational Film Library, Syracuse University, Syracuse 10, N. Y.

Southeast: Vocational Film Library, Department of Agricultural Education, North Carolina State College, Raleigh, North Carolina.

Lower Mississippi Valley and Southwest: Bureau of Film Service, Department of Educational Extension, Oklahoma A & M College, Stillwater, Oklahoma.

Midwest: Visual Aid Service, University Extension, University of Illinois, Champaign, Illinois.

West: Department of Visual Education, University of California, Berkeley 4, California.
Department of Visual Education, University of California Extension, 405 Hilgard Ave., Los Angeles 24, California.
Department of Visual Instruction, Oregon State College, Corvallis, Oregon.
Bureau of Visual Teaching, State College of Washington, Pullman, Washington.

Canada: Canadian Film Institute, 172 Wellington Street, Ottawa, Ontario.

For the Province of Ontario: Distribution Services, Ontario Agricultural College, Guelph, Ontario.

IMPORTANT

Requests should be made well in advance and should include information as to group before which the film is to be shown, date of exhibition (alternative dates if possible), and period of loan.

Request bookings from your nearest distributor.

AVAILABLE LITERATURE

The following literature on the use of fertilizers in profitable soil and crop management is available for distribution. We shall be glad to send these upon request and in reasonable amounts as long as our supply lasts.

Reprints

28-12-45 Better Corn (Midwest) (Circular)
F-3-46 When Fertilizing, Consider Plant-food Content of Crops
S-5-46 What is the Matter with Your Soil?
Y-5-43 Value & Limitations of Methods of Diagnosing Plant Nutrient Needs
A-1-44 What's in That Fertilizer Bag?
QQ-12-44 Leaf Analysis—A Guide to Better Crops
P-3-45 Balanced Fertility in the Orchard
Z-5-45 Alfalfa—The Aristocrat
OO-8-45 Potash Fertilizers Are Needed on Many Midwestern Farms
ZZ-11-45 First Things First in Soil Fertility
T-4-46 Potash Losses on the Dairy Farm
Y-5-46 Learn Hunger Signs of Crops
I-2-47 Fertilizers and Human Health
T-4-47 Fertilizer Practices for Profitable Tobacco
TT-11-47 How Different Plant Nutrients Influence Plant Growth
VV-11-47 Are You Pasture Conscious?
R-4-48 Needs of the Corn Crop
X-6-48 Applying Fertilizers in Solution
AA-6-48 The Chemical Composition of Agricultural Potash Salts
CC-10-48 Starved Plants Show Their Hunger
OO-11-48 The Use of Soil Sampling Tubes
SS-12-49 Fertilizing Vegetable Crops
BB-8-50 Trends in Soil Management of Peach Orchards
I-2-51 Soil Treatment Improves Soybeans
X-8-51 Orchard Fertilization Ground and Foliage
BB-10-51 Healthy Plants Must Be Well Nourished
II-12-51 Pasture Improvement With 10-10-10 Fertilizer
KK-12-51 Potassium in Animal Nutrition
A-1-52 Research Points the Way to Higher Levels of Peanut Production
E-3-52 Ladino Clover—Its Mineral Requirements & Chemical Composition
H-3-52 The Relative Merits of Inorganic & Organic Sources of Plant Nutrients
L-4-52 Efficient Use of Fertilizer in the Southern Region
O-4-52 Tomato Production for the Canning Industry
Q-5-52 Potassium-nitrogen Balance for High Corn Yields
Y-10-52 The Nutrition of Muck Crops
CC-12-52 The Leaf Analysis Approach to Crop Nutrition
B-1-53 Commercial Fertilizer Is a Sound Investment
I-2-53 Soybeans Is a Good Drought Crop
J-3-53 Balanced Nutrition Improves Winter Wheat Root Survival
K-3-53 Kudzu Keeps Growing During Droughts
N-4-53 Coastal Bermuda—A Triple-threat Grass on the Cattleman's Team
P-4-53 Learning How to Make Profits from Sweet Potatoes
S-5-53 More Cotton on Less Land
T-5-53 Trefoil Is Different
W-6-53 The Development of the American Potash Industry
AA-8-53 Strong Roots Make High Corn Yields
CC-10-53 More Effective Fertilizer Use Needed in the Northeast
DD-10-53 Sampling Soils for Chemical Tests
FF-10-53 Testing and Reclaiming Alkali Soils
II-11-53 The Importance of Legumes in Dairy Pastures
JJ-11-53 Boron—Important to Crops
KK-11-53 A Convenient Quick-test for Potash in Coastal Plains Soils
MM-12-53 White Birch Helps Restore Potash-deficient Forest Soils
NN-12-53 Continuous Plant Cover—the Key to Soil and Water Conservation
OO-12-53 General Rules Concerning Plant Nutrients
B-1-54 High-level Fertility Makes Balbo Rye Roots More Effective
C-1-54 Soil Test Summaries Can Be of Value to Many Groups
D-1-54 Relation of Potash and Phosphate to Cold Injury of Moore Pecans
G-2-54 Wisconsin Tops the Nation's 1953 Average Corn Yield
I-2-54 Lime and Fertilizer Pay Off
J-2-54 Feed in the Northeast—Buy It or Grow it?
K-2-54 Soil and Plant Analyses Increase Fertilizer Efficiency
L-2-54 Alfalfa Regains Favor With Tennessee Farmers
M-3-54 Peanut Production Trends in North Carolina
N-3-54 Fertility of Georgia Soils as Shown by Soil Tests
O-3-54 A New Spray for the Cure of Lime-induced Chlorosis
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U-4-54 Nutrient Balance Affects Corn Yield and Stalk Strength
V-4-54 Tung Culture Finds a Place in South Mississippi
W-4-54 Some Reasons for Poor Crop Stands

THE AMERICAN POTASH INSTITUTE

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A young man who had just received his degree from college rushed out and said, "Here I am, world; I have my A.B."

The world replied: "Sit down son and I'll teach you the rest of the alphabet."

* * *

Sadie—"When I get married I am going to be a real good wife to my husband. I'm going to learn how to cook and I'll darn my husband's socks and when he comes home at night after a hard day's work at the office, I'll light his pipe and bring his slippers. Now what else could a husband expect?"

Ruthie—"Nothing, unless he is evil minded."

* * *

Mrs. Flanagan: "Good morning, Mrs. Murphy. You're looking fine this morning."

Mrs. Murphy: "I'm sorry I can't say the same for you, Mrs. Flanagan."

Mrs. Flanagan: "You could if you were as big a liar as I am, Mrs. Murphy."

* * *

Aunt Mandy had just given birth to her sixteenth child. A rather prim young social worker was remonstrating with her over the size of her family in relation to her economic status. Aunt Mandy was having none of it.

"Yes ma'am, ah understands," said Aunt Mandy, "But that birth control is all right for you single folk . . . I'se married."

Two men, looking for odd jobs, called on a lady who was noted for her charitable work. She gave them some cleaning work, including carpet beating. She went out and saw one of them turning hand-springs all over the back yard while his mate was helpless with laughter.

"How clever," said the lady of the house. "I wonder if he would do that at a children's party I'm running."

"Dunno, lady," said the merry one. "I don't think he's ever been hit on the shin with a broom handle before."

* * *

Man on beach: "I'm trying to find out which one of you fellows just rescued my mother-in-law from drowning."

Lifeguard: "Control yourself, pal. We're four to your one."

* * *

She: "Sheriff, your new son-in-law marched up to the altar as though he had lead in his pants."

Sheriff: "He did."

* * *

Wife to husband: "I scratched the front fender a little, dear. If you want to look at it, it's in the back seat."

* * *

The chairman's introduction was such a eulogy that the speaker looked bewildered as he stood up. "Ladies and gentlemen," he began, "I can hardly wait to hear what I am going to say."

NOW AVAILABLE...

FOR AGRICULTURE! *Here's a natural calcium borate mineral of low solubility for preventing and correcting boron deficiency in light-textured soils and areas of high rainfall! Now we offer a worthy companion product to supplement our popular, but more soluble, Fertilizer Borates...*

Your newest source of Boron for plant foods.

COLEMANITE
HIGH GRADE

COLEMANITE-HIGH GRADE provides lengthy boron nourishment for crops on light and porous soils—or in high rainfall areas. Because of its low water solubility, COLEMANITE is especially suitable for borating general purpose and premium grade fertilizers that may be applied to COTTON and to boron-sensitive crops (i.e.: tobacco, sweet corn, potatoes, beans) which require certain minimum amounts of boron over a season. The release of boron by COLEMANITE is slow and extended—a single application will suffice for a season—and therefore preferable for use on boron-sensitive crops which could be adversely affected by an excessive dosage of boron at one time. COLEMANITE-HIGH GRADE and FERTILIZER BORATES team up to broaden your use of borated fertilizers!

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